PRODUCTS finishing

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H. LEROY BEAVER

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Corrosion--

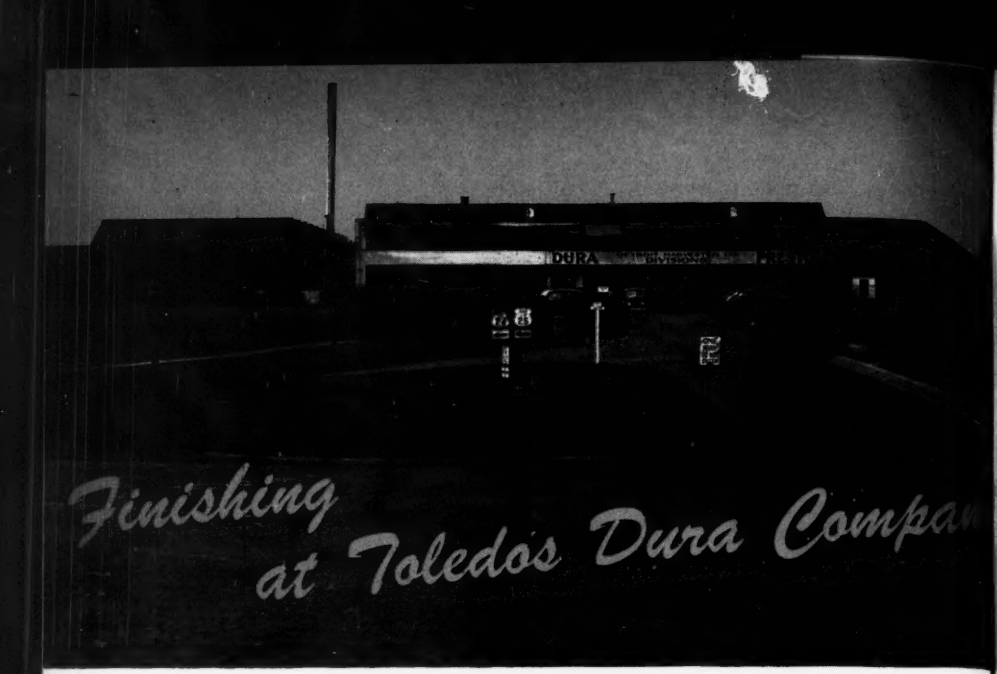
Corrosion is the most destructive agency at work on metals. Its rate of attack, varying with environment, on unprotected steel products ranges from an insignificant amount to as much as one-half inch penetration per year. It has been estimated that the world cost of replacement and prevention attributed to corrosion is approximately two billion dollars annually.

The exact mechanisms under all conditions of rusting have not been definitely established as yet, but it has been shown that the presence of both oxygen and water are required. Thus, from a practical standpoint, rust prevention becomes a problem of keeping moisture and oxygen away from a surface. This may be accomplished by coating the surface in a number of different ways such as with oxide, phosphate, or sulfide; non-metallic coatings as enamels, paints, lacquers, and petroleum base coatings or films.

In practice the most desirable protective coating for a given metal depends on numerous factors. Besides economic and aesthetic considerations, the chemical environment and mechanical requirements are important. Important conditions affecting corrosion processes are the composition, physical state, and surface nature of the protective coating as well as such variables as temperature and temperature fluctuations, nature and solubility of corrosion products produced, circulation or movement of medium in immediate contact with the coating, plus other well-known influences such as humidity, dust and atmospheric polution.

The examination of metals during corrosion, or after it has occurred, may indicate much about the cause of the corrosion and why it continues. It should include microscopic examination of the surface with the corrosion product in place and also after the corrosion product has been removed. This should indicate in most cases the general "form" of the corrosion; that is, whether it has been a **direct chemical** action, a **pitting, galvanic** action, **concentration** cell corrosion, **dezincification,** or **corrosion cracking** or **corrosion fatigue.** Of course, several of these effects may take place at the same time but it is usually the case that where failure has occurred it is directly attributable to one of these forms, with possibly some help from a second. Each one of these forms is accompanied by typical signs which are not difficult to read with a little experience.

In making laboratory or service tests of corrosion processes, it is always desirable to make a diagnosis as rapidly as possible. It may often be a matter of some difficulty of judgment to decide which one of the various forms of corrosion occurring in the early stages is the one which will cause the final failure. Many of the mistakes which are made in evaluating corrosion tests are due to failure to make such judgment correctly. For instance, it is a mistake to assume one metal is better than another or one condition less harmful on the basis of loss of weight, which is a good measure of direct chemical corrosion, if the final failure is to be by pitting rather than by direct chemical corrosion. Each form of corrosion has its own measures and the correct one must be selected to judge values correctly.



Finishing at Toledo's Dura Compa

By BRYANT W. POCOCK

THE Dura Division of Detroit Harvester Co., Toledo, Ohio, is manufacturer of automobile parts such as hardware, window channels, hydraulic convertible top lifts, and window regulators, including the new automatic hydraulic type. Additional products are fabricated, but probably 80 per cent of the total are of an automotive nature.

The basis metal for most of these parts is either die-cast metal, brass or steel. With regard to die-cast or white metal parts, long experience in the complete fabrication of such parts has convinced Dura engineers of the futility of attempts to produce acceptable finishes on poor castings. Die castings, for example, which contain cold shots are found certain to end up with inferior finishes that cannot be attributed to faulty plating. Factors such as the age of the die or the temperature at which the metal fills the die may result in objectionable features in a part which will persist throughout all subsequent phases of manufacture. Rule number one, therefore, consists of starting out with as perfect a casting as possible—a rule which necessitates preliminary close examination of castings before anything further is done with them.

Dura Company maintains and operates a polishing and buffing department which is housed in a large room adjacent to the die-casting department. Notable in this department are two huge Udylite automatic buffing machines, each containing 8 stations. Figure 1 shows a wheel approaching a typical station on one of these machines. The part, an automobile door handle, immediately to the right of the wheel is about to receive a stage of buffing on one side. After a succession of passes at different angles, the arm supporting the part will swing the latter over to the other side (the row of rests along the outside), where it will be buffed from different angles on the opposite side.

An interesting feature of buffing as carried out at Dura can be seen in this figure. This consists of the manner of feeding the buffing compound to the wheel. As seen in the illustration, the buffing compound, extruded tripoli, is in the form of a stick. This stick has been inserted into a hollow rectangular holder in front of a spring, which maintains constant pressure of the tripoli against the periphery of the wheel. It is interesting to observe that a new stick of tripoli, reputed to be a mixture of grease and pumice, lasts only 15 minutes in this setup. At this stage, about one-third of the stick still remains unused. This cannot be used up because of the distance between the receptacle and the wheel, however, the short pieces are collected and sent back to the vendor for remolding into long sticks. The Dura Company for various reasons plans future experimental installations involving methods of spraying buffing compounds. An additional point of interest is that a 14-inch buffing wheel will last about 12 hours in the automatic.

Figure 2 shows a portion of Dura Company's well-equipped racking room. All plating racks used in the plant are fabricated, coated, and repaired in this room. All are constructed with brass splines and phosphor bronze contacts, all joints being tin soldered. Racks are dipped in Bunatol No. 160 coating compound 6 times to produce a finished protective coat. Several of the various types of racks used at Dura can be seen in the illustration.

After polishing and buffing, parts are racked and placed on a monorail conveyor running through a soak tank for 4 minutes in a 1:20 concentration of Solventol No. 27 B maintained at pH 7.0 and at a temperature of 170 deg. F. Figure 3 illustrates the next stage for die-cast and brass parts. Here the parts are shown racked and hung on a monorail system, entering and leaving a 3-stage Solventol washing machine. The first stage of this machine contains a 1:40 concentration of Solventol 27 B at 140 deg. F. maintained at pH 2.5 by means of a control solution having a sulfuric acid base. Time in the first stage is 30 seconds. The pH of 2.5 in this stage is very important as this acts to emulsify dragged-over particles of tripoli, keeping most of these confined near the surface of the bath so that pumping action from the interior of the bath does not spread them. The second and third stages in this washer consist of successive 30-second water rinses at 130 deg. Fahrenheit.

After leaving the Solventol washer, the die-cast parts are given a precleaning treatment in a special 4-tank precleaning unit. These tanks are ar-

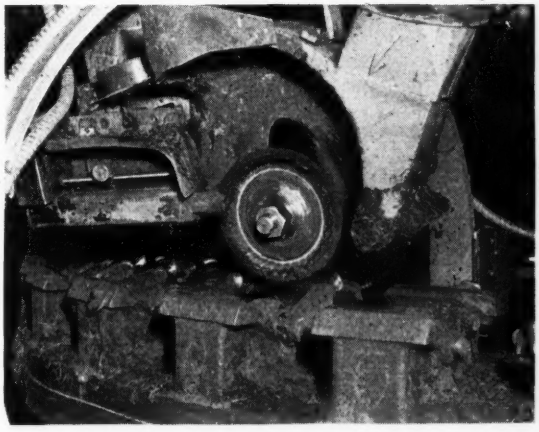


Fig. 1—Close-up view of typical station on one of Dura Company's two Udylite automatic buffing machines, showing method of feeding buffing compound to the wheel

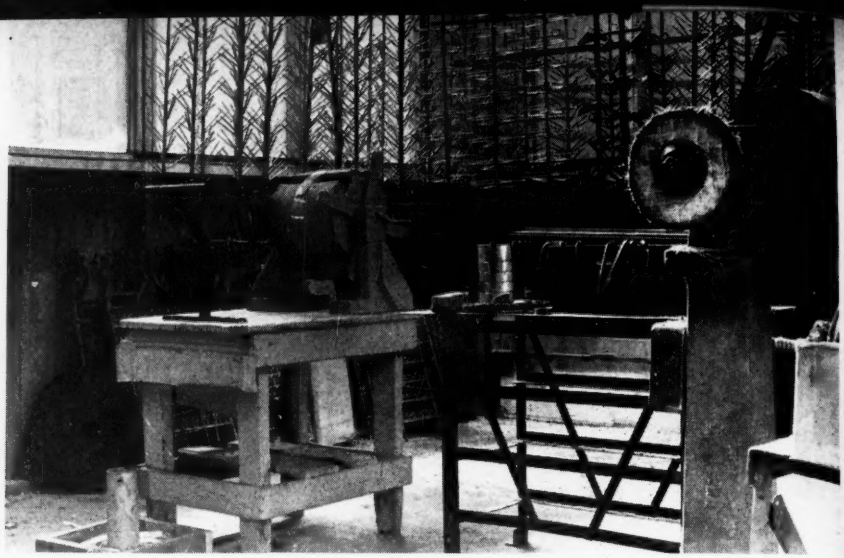


Fig. 2—Portion of Dura Company's well-equipped racking department. Note coiling machine for copper wire at left foreground. Suspended in background are several types of coated racks ready for use on production line.

ranged in the following order:

1. Cathodic immersion for 30 seconds in 3 oz./gal. trisodium phosphate at 160 deg. F., 6 volts.

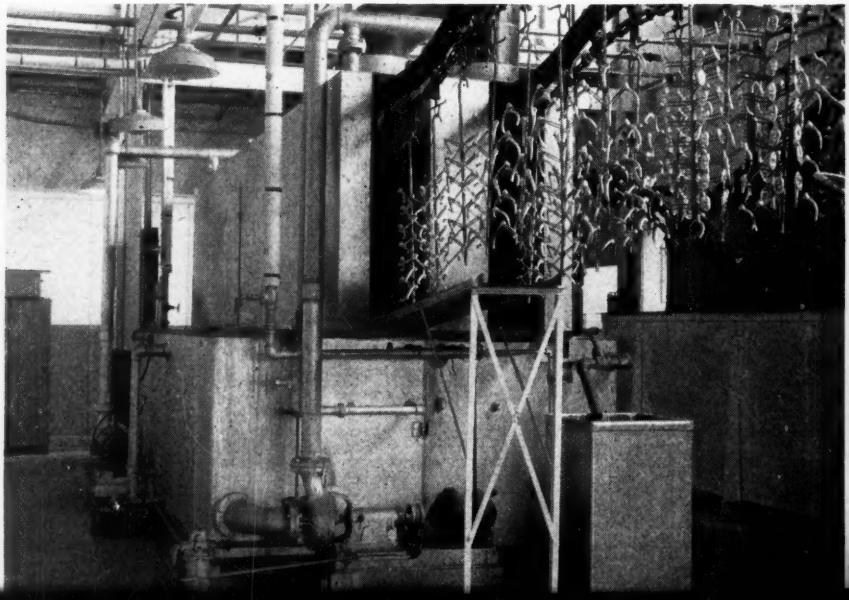
2. Water rinse, 110 deg. F., 10 seconds.

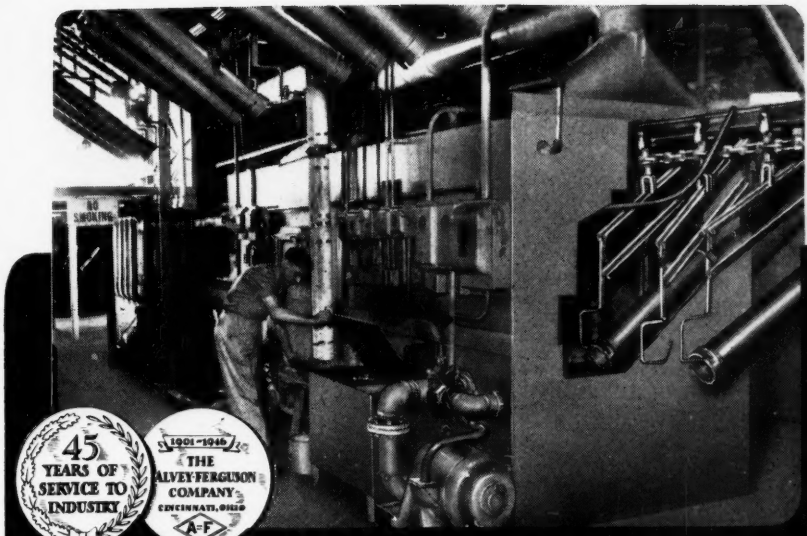
3. Immersion for 10 seconds in 3 per cent (by weight) sulfuric acid at R.T.

4. Water rinse, cold, 10 seconds.

Brass and steel parts are precleaned in a second special unit of 4 tanks arranged as follows:

Fig. 3—Die-cast and brass parts entering and leaving 3-stage Solventol washing machine after buffing and before copper and nickel plating.





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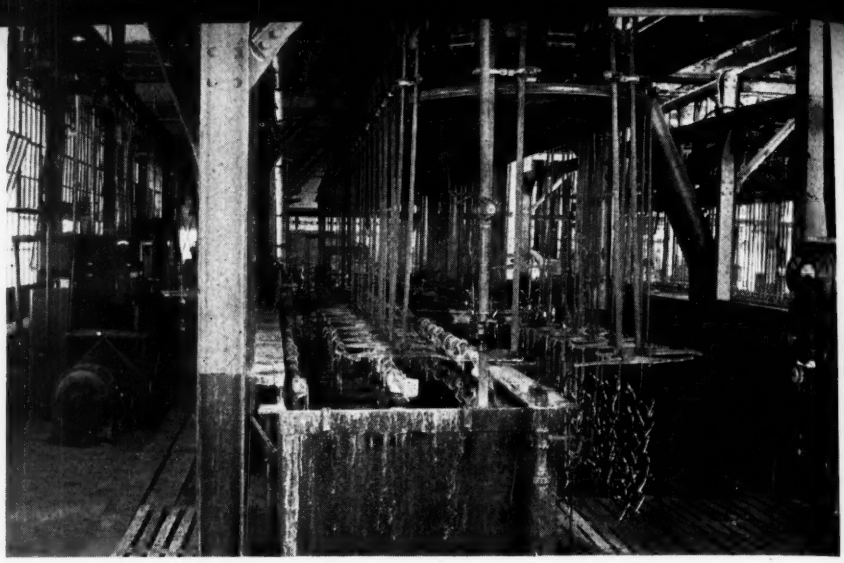
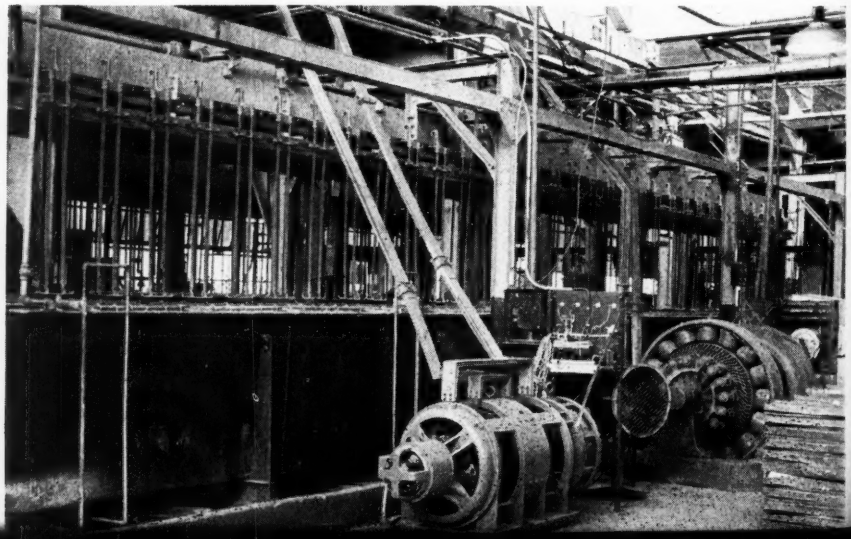


Fig. 4—H-VM-M automatic plating machine installation at Dura Company. Both machines are used for copper and nickel plating. The unit in center is for interior hardware and that on right for exterior hardware.

1. Anodic immersion for 30 seconds in 10 oz./gal. Oakite No. 90 at 180 deg. F., 6 volts.
2. Water rinse, 110 deg. F., 10 seconds.
3. Immersion for 10 seconds in 50 per cent muriatic acid, R.T.
4. Water rinse, cold, 10 seconds.

Figure 4 center shows Dura Company's installation of a Hanson-Van Winkle-Munning automatic plating machine used for copper and nickel plating. This unit is used to plate all parts intended for interior hardware. Parts intended for exterior hardware are copper and nickel plated in a sim-

Fig. 5—Side view of H-VW-M automatic plating machine for copper and nickel plating on exterior hardware. Note 3,000-ampere generator for copper at left foreground and 5,000-ampere generator for nickel at extreme right.



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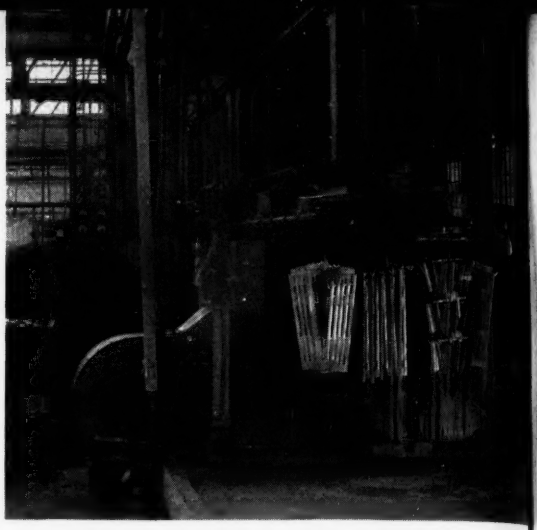


Fig. 7—Large Udylite automatic for plating with cadmium

ilar automatic seen at the right of the illustration.

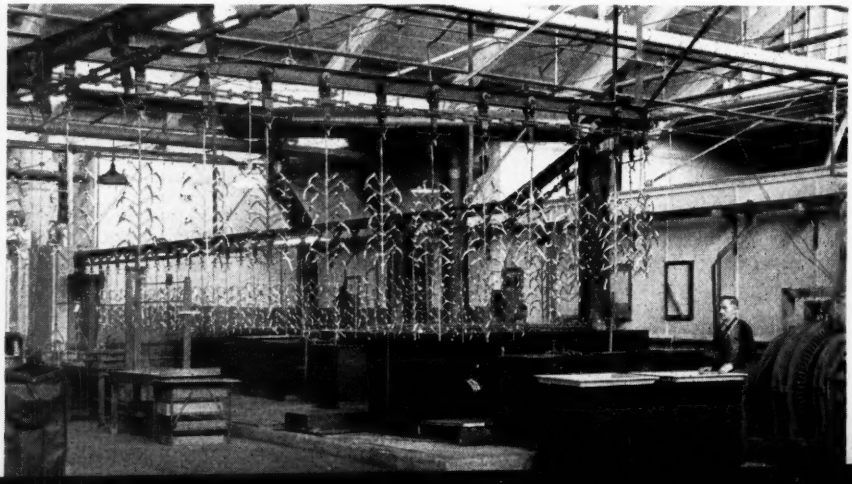
Interior hardware to be copper and nickel plated, usually in preparation for subsequent chromium plating, undergo the following steps in the automatic:

1. Rochelle copper bath. Time, 8 minutes. Average thickness of plate, 0.00025 inch.
2. Water rinse, cold. Time, 25 seconds.
3. Sulfuric acid dip, 2 per cent at R.T. Time, 25 seconds.
4. Water rinse, cold. Time, 25 seconds. Both cold water rinses accompanied by exterior spraying to keep parts thoroughly wet while in air, important in preventing formation of blisters.
5. Modified Harshaw bright nickel bath. Time, 18 minutes. Average thickness of plate, 0.0005 inch.
6. Water rinse, cold. Time, 50 seconds.
7. Racked parts are now put on another conveyor for transmission to the chromium plating department.

Exterior hardware to be copper and nickel plated, likewise usually in preparation for chromium plating, are handled essentially in the same manner in the other H-VW-M automatic (Fig. 5). The only differences are increased times of plating set to produce a minimum coating of 0.0003 inch of copper followed by 0.0007 inch of nickel.

The Rochelle copper bath used in

Fig. 6—View of Dura Company's chromium plating department, showing racked parts before and after chrome plating. Note direct hookup of copper bus bars with 7,500-ampere generator and direct contacts to tanks. All ventilating ducts are connected into common exhaust system.



. . . in this full-automatic plating cycle at

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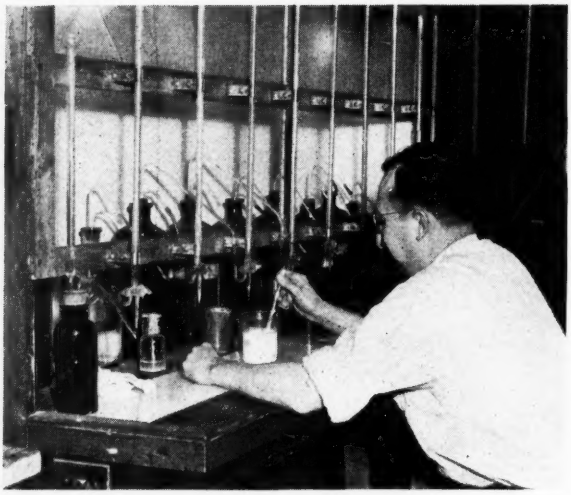

Fig. 8—Titration assembly in Dura Company's control laboratory. Note well-designed back lighting and white marble beaker support.

●

Dura Company's chromium plating department is shown in Fig. 6. Noteworthy features include excellent lighting and excellent ventilation. Notable also is the direct hookup of copper bus bars with the 7,500-ampere 6-volt generator at the right of the figure, with direct contacts to each tank. Racked parts entering this department on the monorail system undergo the following steps:

1. The racks are removed from the conveyor.
2. Racks are immersed in an activating dip of 10 oz./gal. sodium cyanide at R.T. Time is 30 seconds at 9 volts cathodic.
3. Water rinse, cold. Time, 10 seconds.
4. Chromium plating bath, decorative. Time, 1½ minutes. Average thickness of deposit, 0.000015 inch.
5. Water rinse, cold. Time, 10 seconds.
6. Water rinse, hot. Time, 10 seconds.
7. Racks returned to conveyor.
8. Racks conveyed through hot water spray to remove any remaining traces of chromium plating solution. Time, about 15 seconds. Parts can be seen entering spray cabinet at far left, Fig. 6.
9. Racks conveyed on through hot air drier beyond spray cabinet.
10. Parts unracked, sent to assembly.

the automatics has the following characteristics:

Copper	2.75 oz./gal.
Free cyanide	0.8 oz./gal.
Total cyanide	4.75 oz./gal.
Rochelle salt	6.00 oz./gal.
Soda ash (Na_2CO_3)	4.25 oz./gal.
Sodium hydroxide	0.33 oz./gal.
E.M.F.	3.5 volts
Temperature	140 deg. F.
Time, interior hdw.	8 minutes
Time, exterior hdw.	12 minutes
Anodes	bar copper

The modified Harshaw bright nickel bath used in the automatics has the following characteristics:

Nickel sulfate	42—45 oz./gal.
Nickel chloride	6 oz./gal.
Boric acid	5.5—6.0 oz./gal.
XXXD non-pitting agent,	0.25 per cent by vol.
XXX20 brightener	4 qt./1000 gal.
pH	3.0—3.2
E.M.F.	4.5—4.8 volts
Temperature	140—145 deg. F.
Time, interior hdw.	18 minutes
Time, exterior hdw.	25 minutes
Anodes	Harshaw cast XXX carbon

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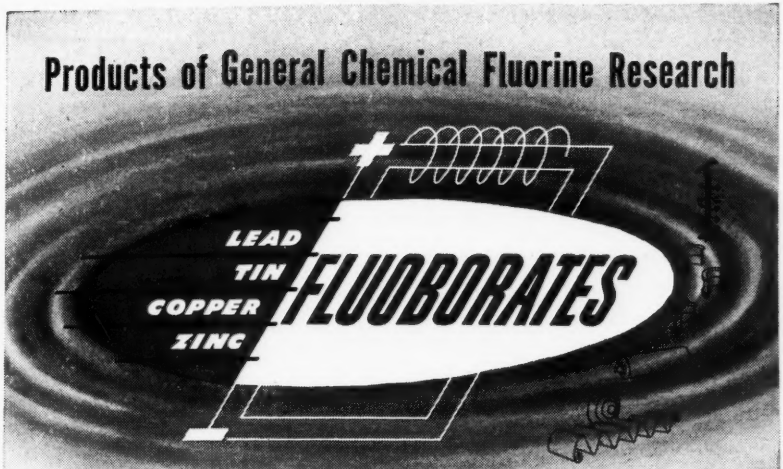

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The chromium plating solution used in the above bath has the following characteristics:

Chromic acid .....55 oz./gal.
Sulfuric acid 0.55—0.6 oz./gal. as (SO_4)--
Ratio.....100:1 to 90:1, ave. 95:1 of chromic acid to sulfuric acid
E.M.F. .....4—6 volts
Temperature .....120—130 deg. F.
Anodes.....sawtooth lead bar anodes containing 7 per cent antimony

Figure 7 shows Dura Company's huge Udylite automatic for plating with cadmium. This machine, 54 inches in depth, is one of the deepest ever made of the hydraulic type. Racked parts to be cadmium plated in this unit pass through the following steps:

1. Anodic cleaning for 2 minutes in a 10 oz./gal. solution of Oakite No. 90 at 180 to 190 deg. F. Tanks fed by 2 rectifiers at 9 volts, 1,500 amperes each.

2. Water rinse, cold. Time, 12 seconds.

3. Acid dip, muriatic acid, 25 per cent at R.T. Time, 2 minutes.

4. Water rinse, cold. Time, 12 seconds.

5. Cadmium plating at 5 volts. Time, 14 minutes. Average thickness of plate, 0.0003 to 0.0005 inch.

6. Water rinse, cold. Time, 12 seconds.

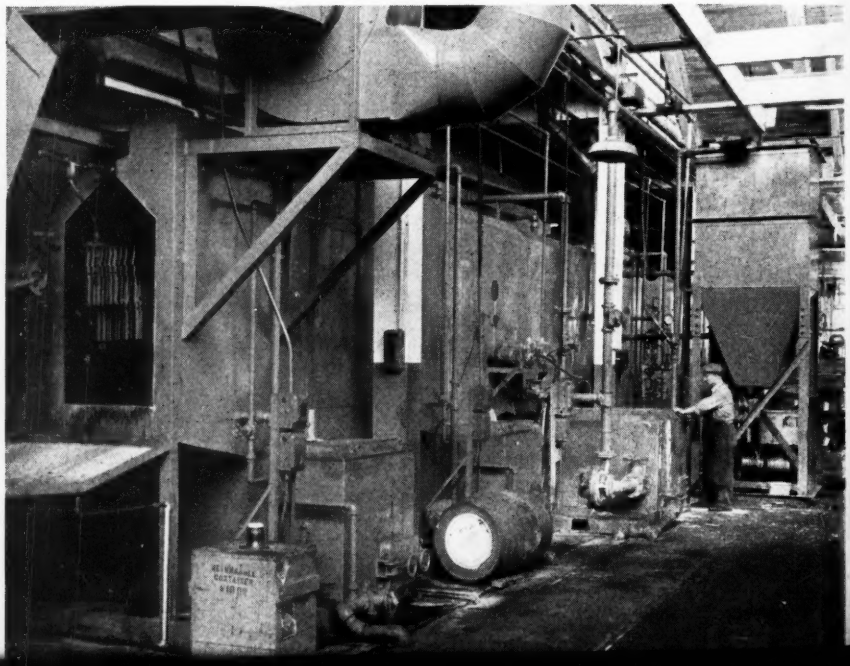
7. Water rinse, hot (160 deg. F.). Time, 12 seconds.

8. Hot air drying. Time, 2 minutes.

The cadmium plating solution used in the Udylite automatic has the following characteristics:

Cadmium _____3.5 oz./gal.
Cadmium oxide _____3.9 oz./gal.
Sodium cyanide (total)____17 oz./gal.
Sodium hydroxide _____2.5 oz./gal.
Brighteners used simultaneously:
Rohco No. 20 for low current density _____1.3 oz./gal.
Rohco No. 50 for high current density _____2.0 oz./gal.

Fig. 9—Partial view of exterior of huge Detrex 5-stage washing and Bonderizing machine installation at Dura Company. Each stage comprises a 600-gallon spray system complete with individual controls.



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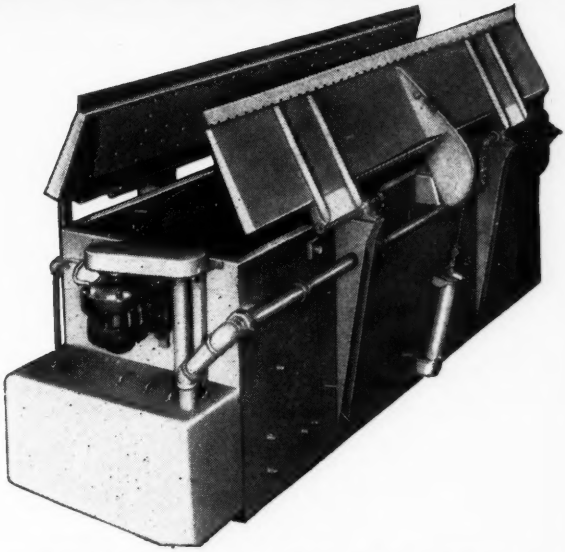

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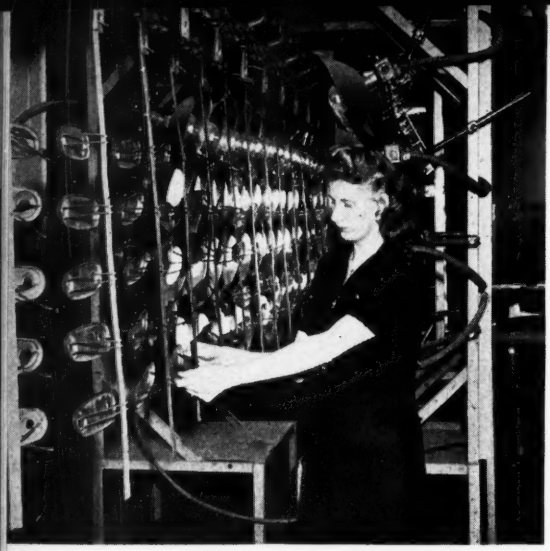

Fig. 10—Dura employee inspecting lacquered part on rack prior to drying between banks of infra-red lamps.

E. M. F. ----------3.0 to 5 volts
Temperature ----------R. T.
Anodes ---------- spherical cadmium

Note: Brighteners marketed by Hull Chemical Company.

Dura Company's barrel plating department contains 3 units for zinc, 2 for cadmium, 1 for copper, and 1 for nickel. Udylite barrels are used throughout. Before barrel plating, parts are immersed for 3 to 5 minutes with no current in an 8 oz./gal. solution of Wyandotte No. 39 at 180 deg. F. This is followed by a cold water rinse, an acid dip in 50 per cent muriatic acid, and a final cold water rinse. After plating, a cold water rinse is followed by drying in a Crown Rheostat Company centrifugal dryer. Certain zinc-plated parts on customer demand are either Cronak dipped or Iridited.

The zinc plating bath has the following characteristics:

Zinc ---------- 4.5 oz./gal.
Zinc cyanide ---------- 8 oz./gal.
Sodium cyanide ----------13.5 oz./gal.
Sodium hydroxide ----------12 oz./gal.
Udylite zinc brightener-- 0.1 oz./gal.
E. M. F. ----------2-4 volts, still
6-8 volts, bbl.
Temperature ----------R. T.
Anodes ----------spherical zinc

Tumbling is performed at Dura Company on steel interior hardware parts in one or both of 2 tumbling barrels, products of Sturgis Company. Granite stone is used in three barrels for polishing and honing.

Figure 8 shows a portion of Dura's control laboratory. Mr. B. Gomersall, the chemist shown checking the concentration of a plating solution, has the advantage of a superbly backlighted titration assembly. Note also the white marble beaker support running the full length of the table. This particular unit is extremely well designed.

Bonderizing is done at Dura Company in an enormous Detrex 5-stage washing and Bonderizing installation. Each of the 5 stages of this huge machine comprises a 600-gallon individual spray system. A portion of the machines' exterior is shown in Fig. 9. The stages are as follows, time being 1 minute in each stage:

1. Cleaner. Temperature, 140 to 150 deg. F. Composition, Terg (DuBois) or Oakite No. 63. Concentration, ¼ oz./gal.

2. Water rinse, warm. Temperature, 120 deg. F.

3. Bonderize. Temperature, 150 to 160 deg. F. Composition, Bonderite No. 125. Concentration, 15 points. (See below.)

4. Water rinse, cold.

5. Chromic acid bath. Temperature, 160 to 180 deg. F. Concentration, ¾ oz./100 gal.

The point system developed for Bonderizing and Parkerizing solutions is based on the following procedure. The

chemist titrates a 10-ml. sample with 0.1 N. sodium hydroxide using phenolphthalein indicator. The number of milliliters of sodium hydroxide required to reach end point is equal to the "points" of the solution.

Parts to be Parkerized at Dura are first degreased in a Blakeslee degreaser using Blacasolv. They are then immersed for 45 minutes in Parkerizing solution, concentration 30 points. This is followed by a cold water rinse and then by a dip in chromic acid, ¾ oz./100 gal. concentration at 180 deg. F. Parts are then centrifugally dried, dipped in Paraloc No. 2 B oil supplied by Parker Rust-Proof Company, and centrifugally dried very lightly to remove excess Paraloc.

Dura's conveyor system is of the company's own design, electrically operated, and made up of two units of monorail. It is designed to eliminate all unnecessary trucking and handling of parts. From the time parts leave the buffing department until they are completely finished, they do not leave the racks for reracking.

The Dura Company in common with most companies engaged in the finishing of metal products has witnessed considerable growth and advancement in finishing technology during the past eight years. From a practical standpoint, the company believes that adequate filtration of plating baths has contributed in no small measure to these improvements in finishing. Copper and nickel baths formerly filtered once a month are now subject to constant filtration. The nickel bath, for example, undergoes continual pumping from one end of the tank to the opposite end through an Industrial filter of 2,500 gal./hr. capacity at a rate calculated to produce a complete turnover of the solution every 2 hours. The filter is cleaned every week and a new filter pack installed. Packs used are of Industrial Filterbesto No. 5.

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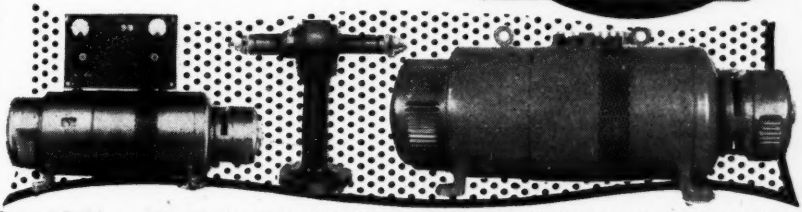

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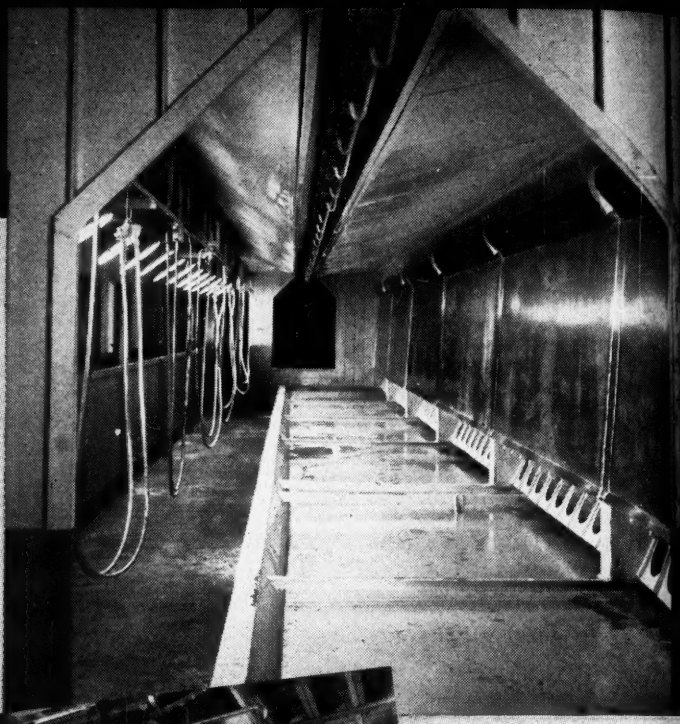

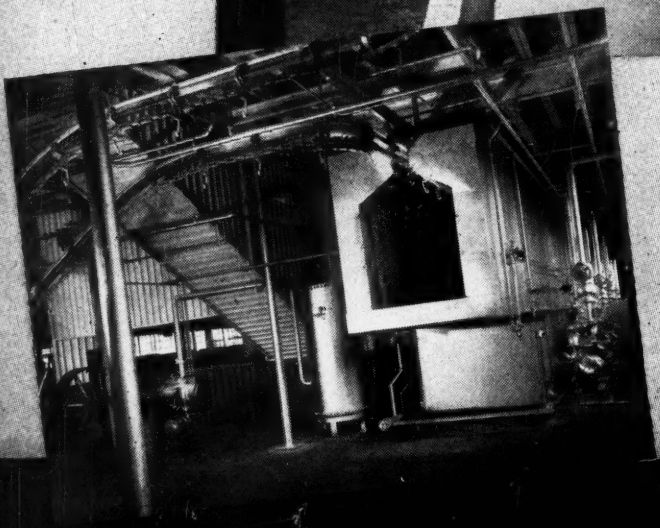

Above: Mahon Hydro-Filter Sp
Booths—Part of the Acme In
lation. At right: Enclosed Sp
Room which houses all pain
operations in the same insta
tion. Note Plate Glass Windo
At Left: Metal Cleaning and I
Proofing Equipment—Part of
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and the Up-Tunnel to the Ba
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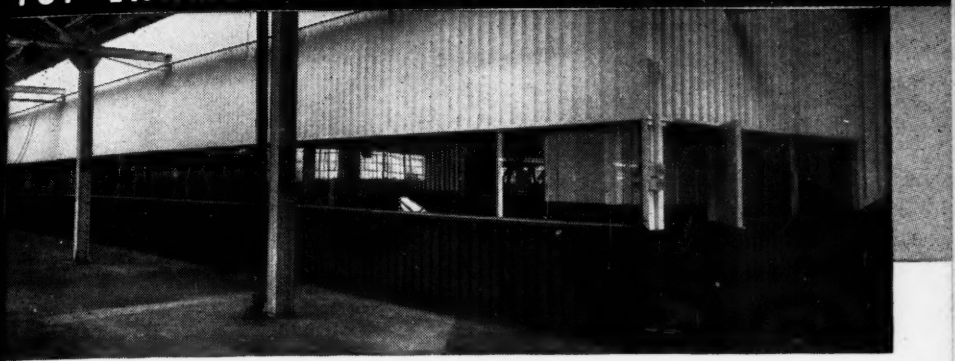

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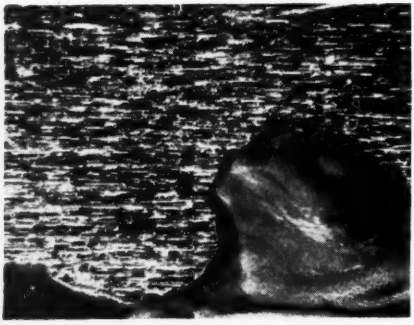
MAHON

Preparing Steel Surfaces for Maximum Paint Adhesion

By CHARLES DELMAR TOWNSEND
Process Engineer

MOST everyone is familiar with the rigid requirements of both the Army and the Navy concerning the adhesion of the protective paint to equipment. Since such paint is produced to specifications that make it capable of withstanding severe conditions, the material surface to which this paint is applied is very important. The surface must be such that the paint will not chip or peel when exposed to salt air and the broiling sun. The coating is only as good as the bond, and the bond depends entirely upon the surface of the metal prior to painting.

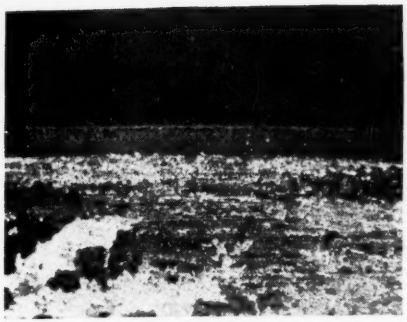
Illustration showing a painted steel surface magnified 100 times on which the paint has been removed with a sharp instrument. Note the manner in which the paint is easily worked loose from the bare cold-rolled steel surface. The streaked area at the upper portion of the illustration is the magnified steel surface. The paint film is conspicuous at the lower portion of the illustration.



It is a well known fact that paint will not adhere to an oily or greasy surface. It will tend to blister and peel, thus allowing the surface to corrode or rust. Therefore, prior to painting, the metal must be free from all oil, dirt, and grease.

Many methods of obtaining a clean surface suitable for painting are available. However, it has been discovered that metal cleaned by the phosphate treatment affords an ideal surface for paint bonding, with parts thus treated withstanding rough handling, prolonged outdoor exposure and having a high resistance to corrosion.

In the third century A. D., the Romans are reported to have used a phosphate treatment to coat some of their metals. The phosphoric acid treatment of steel has been known for centuries to have produced an ideal surface for painting and, in recent years, the use of this treatment on steel and zinc has become widespread. However, the phosphoric acid treatment has its certain requirements for successful use, the primary one being that the metal must be previously degreased. The



The upper portion of this illustration shows a piece of steel coated with Oakite CrysCoat. The bottom section shows the paint adhering to the surface after being scraped with a sharp instrument. The dividing line between the base surface and the paint indicates the excellent paint adhesion as achieved on CrysCoated surfaces. The illustration is magnified 100 times.

control of the pH must be extremely rigid or the deposition on the surface becomes very slight.

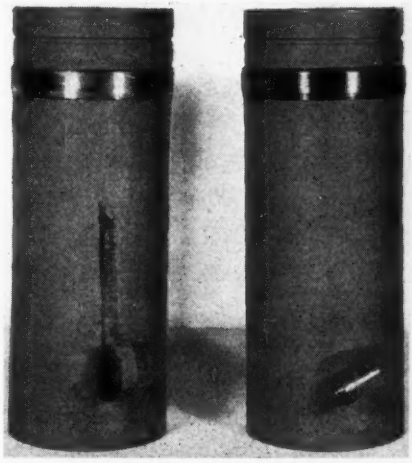
It has been found that even under the most favorable conditions the surface of the metal has not been coated sufficiently to afford maximum paint adhesion. This adhesion is due to the conversion of the surface of the steel into iron phosphate—a crystaline substance which does not rust. Phosphoric acid if used with washing machines will tend to attack the equipment. Therefore, further research has been under way to develop a material that will overcome the disadvantages of the phosphoric acid and yet retain the advantages.

A material answering this general requirement is now being manufactured and has proved very satisfactory in cleaning steel for painting. It is an acidic material that has wetting, penetrating, and emulsifying properties. The combination of the ingredients provides cleaning plus the chemical action necessary to produce a protective coating which affords the metal an ideal surface for painting.

CrysCoat, a product of the Oakite Products, Inc., has been developed to remove all steel surface contamination such as greases, oils, perspiration stains, and residues from soldering. The high-powered wetting agent spreads the solution uniformly over the surface of the metal to be cleaned and allows the penetrating and emulsifying agents to remove the contamination. As the surface dirt is dispersed, the solution reacts with the iron to form a crystaline, non-metallic surface coating. The clean surface now has the oil-absorbing properties required to provide a satisfactory paint bond.

Since the surface coating produced by the reaction of CrysCoat and metal is non-metallic, the tendency of parts to rust is reduced materially. Tests have demonstrated that steel cleaned with this solution can be stored for ninety days without indications of rust

This illustration shows two 75 mm. steel smoke shells. The shell on the left was not properly prepared for painting and, as a result, the painted surface is shown being pulled away from the steel with the use of ordinary Scotch tape. The shell on the right was given a treatment of Oakite CrysCoat before painting, with the result that the paint now adheres firmly to the steel surface.



on the parts. As a result, a great saving in labor is effected in many industries since in the past it has been necessary to oil parts to protect them in temporary storage and then remove the oil when the parts are further processed.

The chemical make-up of the solution is such that it will not affect the surfaces of metal washing machines and, therefore, can be used in this type of equipment with excellent results.

(Photos Courtesy Oakite Products, Inc., New York, N. Y.)

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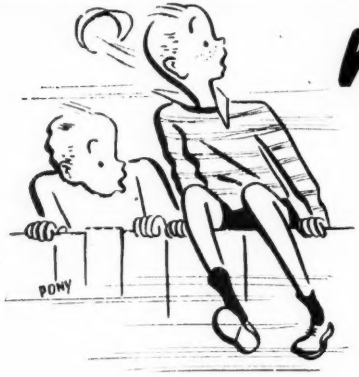
Federal Standard Selenium Rectifier Equipment. The Federal Telephone and Radio Corp., Newark 1, N. J., now has available a 12-page booklet which provides descriptions, illustrations, and tables on power supplies, general purpose battery chargers, electroplating equipment, industrial truck battery chargers, cathodic protection equipment, central station battery chargers, selenium rectifiers, and other equipment. Copy free upon request.

"How to Pick a Winner" is the title of a 16-page booklet on organic coatings which is now being distributed by United Chromium, Inc., 51 E. 42nd St., New York, N. Y. The booklet covers the sources, properties, and applications of the many resins used in synthetic lacquers and protective coatings. To the user of these materials, the booklet, it is believed, will provide valuable assistance in answering questions on the suitability of one type of coating against another for specific applications. Copy free upon request.



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Electrostatic Spraying and Detearing at Japan Company

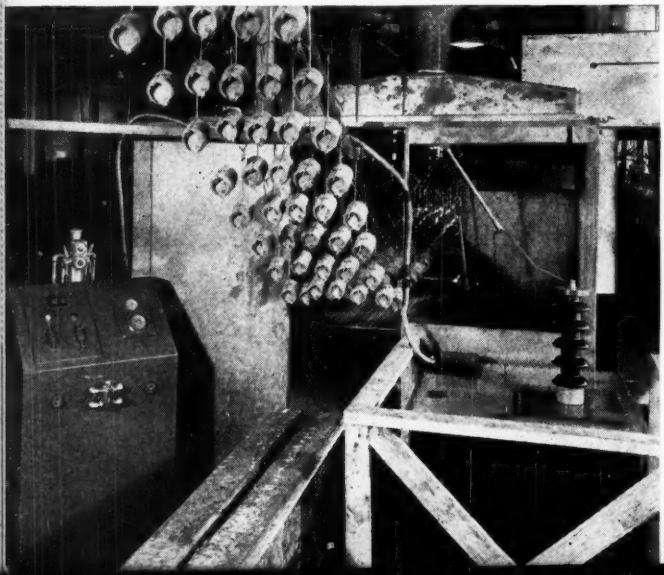
By SANFORD MARKEY

THROUGH the use of an electrostatic field, the Japan Company of Cleveland now produces what is described as a superior painted product at a reduced cost and a greater saving of paint and labor.

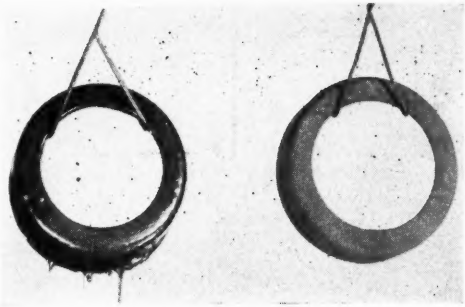
Under ordinary methods of spraying paint on products, considerable waste was realized both in material and labor. In the process of spraying, for example, it was necessary to turn the object in order to have the paint reach all sides. However, in the newly established procedures of spraying with the use of an electrostatic field, the wasted time of turning has been eliminated. In addition, the product is said to have a superior coating with less paint used.

The same was true in dipping. With old procedures, the product usually had tears and fatty edges which required considerable time to remove. By means of the electrostatic detearing of dipped parts, the costly operation and wasted use of manpower to wipe away these tears and edges are eliminated.

Looking at the detearing process more



Parts passing through detearing booth in actual production. The control panel for the electrostatic field is shown at the left and the power pack at the right of the exit booth.



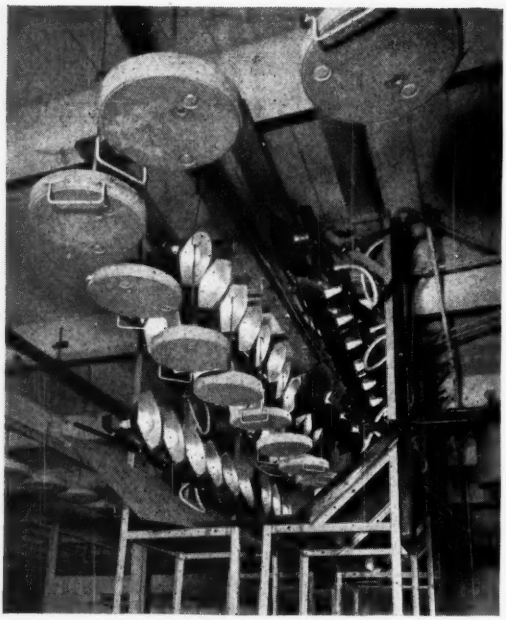
(Left) Part which has been dipped in heavy enamel and allowed to dry without detearing. (Right) Same part after electrostatic detearing and baking

closely, it is generally accepted that dipping has usually been the easiest and most economical means of applying paint. It assures complete coverage with a minimum consumption of paint. However, there is always the problem of the formation of excessive paint tears at the drain-off points which prevents a good finishing job. Frequently, it is necessary to bake the dipped item at a temperature which will assure hardening at the point where the paint is the thickest. Unless this is done, the product will be soft, tacky, and perhaps wrinkled at the point of heaviest paint concentration. At the same time, by baking to meet the needs of the heaviest concentration of paint, there is the possibility of overbaking other sections of the product. To avoid this problem, it is necessary to employ labor to remove, either by a brush or cloth, the excessive amount of paint.

Using electrostatic detearing, the Japan Company has eliminated all of the aforementioned difficulties. The product is placed on a conveyor which carries the work to a tank where it is dipped. As many as five objects can be dipped at one time, depending on the size. The work is then conveyed over a drain board where it is allowed to drain until all surplus paint has fallen and tears are beginning to form.

The conveyor next transfers the work into a booth containing a highly electrified field and a grid. Passing through this grid is an electric current of low amperage but with a very high voltage of about 130,000 volts. As the conveyor enters the booth, it passes

Electrostatically sprayed parts are conveyed through infra-red oven for finish baking.



Close-up view of infra-red oven through which electrostatically sprayed parts are conveyed for finish baking

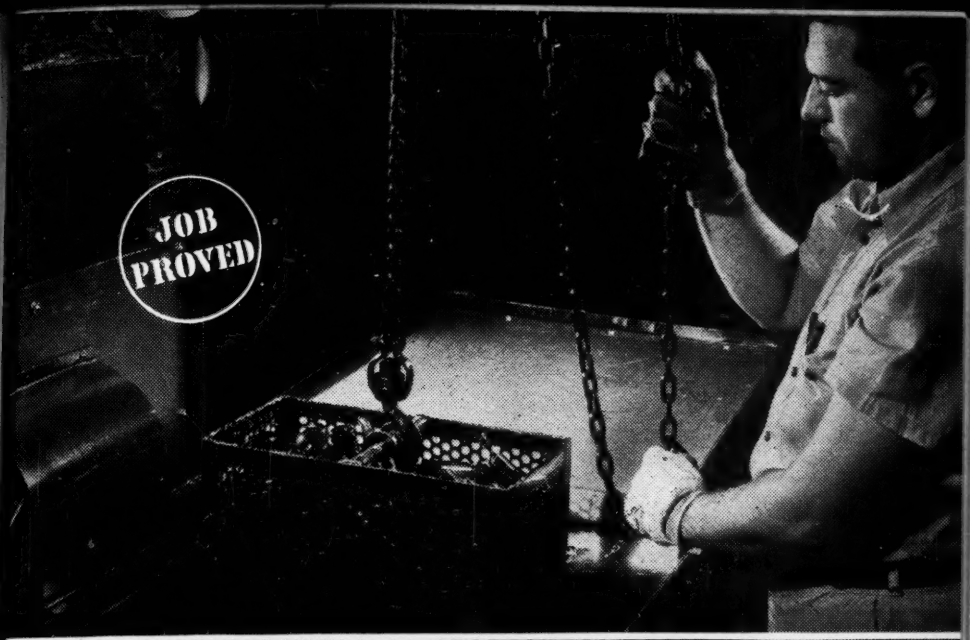
through a field which has been highly electrified. As the work passes over the grid, the grid—with its current—serves as an attractive force which pulls from the object that paint which has begun to form a tear. The result, therefore, is a smoothly, well finished product. The work is now conveyed to a drying booth containing infra-red heating equipment. In the case of two coats, the dipping, detearing, and baking operations are repeated.

Electrostatic Spraying

Electrostatic spraying has a certain similarity to electroplating in that paint is deposited upon the work as it passes through a charged field. In both processes, the placement and deposition of material is electrically controlled. Higher potentials are used in spraying than in plating. A voltage of 130,000 or more has been found necessary to give the minute spray a small charge. Consequently, the spray particles are attracted to the work which has been given an opposite polarity. The attraction of unlike charges results in the deposition of the spray particles on the work with a gratifying degree of uniformity and smoothness.

As in the dipping process, the product is placed on a conveyor and carried into a booth which has been charged and in which the electrostatic field has been created by vertical electrodes charged with at least 100,000 volts of electricity and located within range of a spray gun. As the product enters the field, it is charged and the paint particles are instantly attracted to it. The article is, of course, grounded through its own conveyor hook. The paint, as it leaves the gun, is attracted to the charged object. Instead of the paint shooting around and over the article, it is drawn to all sides of product, giving the appearance of the product being engulfed by a slight fog of paint.

Under the old process of hand spraying, it was necessary to have an operator and three helpers in each booth to assure complete coverage of the article. With the electrostatic procedure, only two booths with one operator and one assistant are necessary. In addition, under the old system, it was generally recognized that as much as 90 per cent of the paint sprayed was wasted. Even with the most efficient methods of operation, when the paint was sprayed at an object only a small



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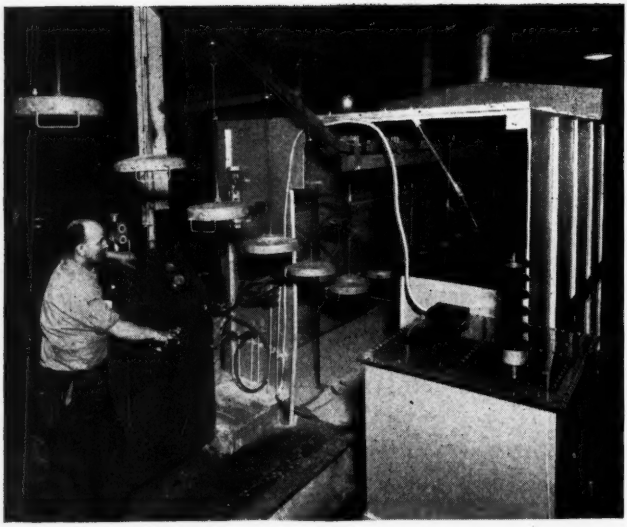

Parts are shown entering spray booth where they are electrostatically sprayed. The "electrified" area can be seen engulfed by electroids. The electrostatic spray operation is controlled by the cabinet at the left.

part of the object was hit. However, in electrostatic spraying, the paint is attracted to all sides and no paint is wasted. Furthermore, the danger of the product chipping is reduced since less paint is used, giving a thinner, more flexible film. And above all, there is a uniformity of film thickness on both the first and last product sprayed.

At the Japan Company, the work loading and unloading points on the conveyor line are practically adjacent. As another space-saving feature, when articles are scheduled for spraying, the dip tanks are removed from under the conveyor and the parts pass directly into the booths into the range of the automatic guns. The speed of the conveyor is dependent, of course, on the article being painted.

Sturtevant Exhaust Fans. The B. F. Sturtevant Co., Inc., Division of Westinghouse Electric, Hyde Park, Boston 36, Mass., now has available a 24-page catalog covering the uses, construction, and sizes of its exhaust fans for handling corrosive or explosive gases; controlling of dust in industrial processes; exhausting fumes and vapors; conveying materials by air; exhausting paint spray booths; handling air and gases at high temperatures; and removing chips, dust, and so on, from metal-working machines. Performance tables provide ratings for fans with wheels from 25 to 60 inches in diameter and with capacities from 680 to 20,000 c.f.m. at pressures from 1 to 12-inch static pressure. A special table affords a short-cut method for determining fan performance, and a chart is included showing pressure loss in round ducts. Copy of Catalog No. 430-3 free upon request.

Saran Coating Materials. The Dow Chemical Co., Plastics Division, Midland, Mich., is now offering technical data booklets on two new Saran coating materials—Saran F-120, a solvent soluble resin imparting very low moisture vapor transmission; and Saran F-122, a latex forming a continuous film upon air drying. Copies free upon request.

Pennsalt PM-90, an acid-type chemical cleaner for metals, is the subject of a pamphlet now being issued by the Pennsylvania Salt Manufacturing Co., 1000 Widener Bldg., Philadelphia 7, Pa. Included are suggested methods for removing boiler scale, general pickling operations, cleaning of heat transfer equipment, and stripping zinc plate. Copy free upon request.

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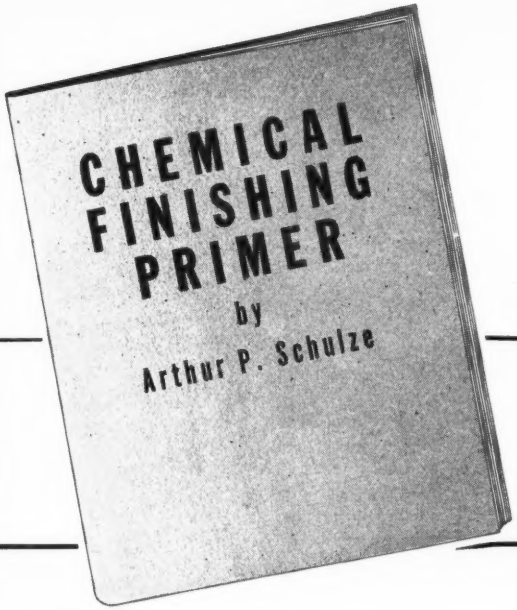
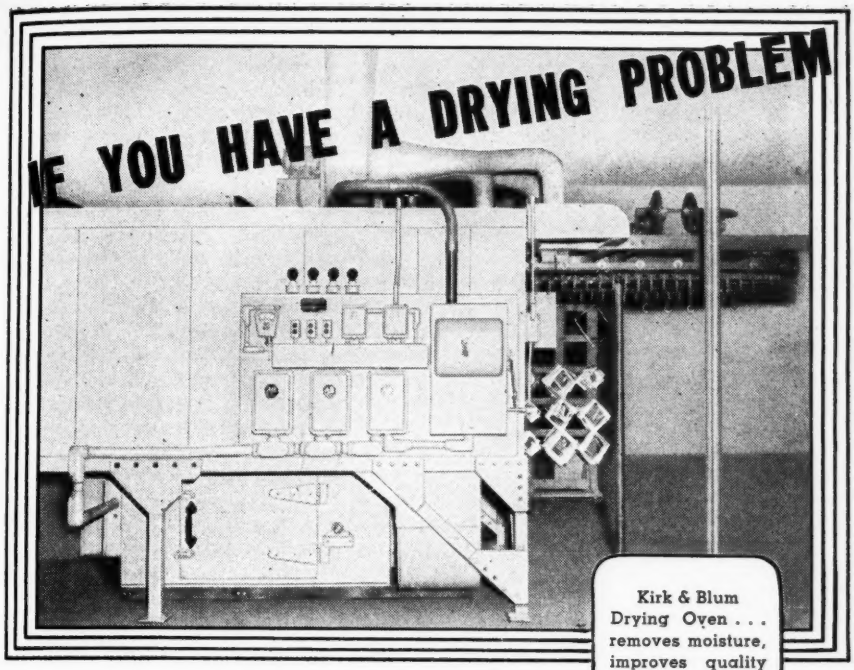


A Capsule Review of Black Oxide Finishing Problems and Solutions

CHEMICAL finishing of metals, as distinguished from protective finishes produced by electrical processes or organic coatings, is a comparatively new technique which has enjoyed phenominal growth since Pearl Harbor. To manufacturing executives, production superintendents, or finishing foremen who have a chemical finishing problem, the following general discussion of the various technical factors and operating fundamentals incident to black oxide finishing in particular of ferrous and non-ferrous metals should prove of interest and value. The purpose here, therefore, is not to outline all the various formulas available so much as it is to review and underscore certain key points and practical considerations relating to application of principles involved, and, in that manner, to help, if possible, prevent errors and mistakes unwittingly committed in various plants now doing this work or contemplating same soon in connection with their postwar products.

Finishing Steel

For producing a black protective finish on steel, those oxidizing processes utilizing a low-temperature salt bath are widely employed today. Briefly, the work cycle may be summarized as follows. After all oil, grease, shop dirt, and similar foreign matter contaminating the parts are thoroughly removed either by alkaline cleaning or solvent degreasing and then any rust, oxide or scale present on the surfaces is removed by suitable pickling, the work is immersed in the oxidizing solution from 5 to 20 minutes, depending upon the particular alloys being treated, and rinsed. Drying, waxing, or oiling of the work according to individual requirements then completes the job.



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On the market under various trade names today are numerous oxidizing salts, which, when dissolved in water, produce a blackening bath having an operating range of from 265 to 315 deg. F. Some are used in a single bath; others are employed in a double tank treatment. Control of the color of the bath is accomplished either manually or automatically by the concentration of the solution, with periodic additions of water being made as required to

compensate for the amount lost through evaporation and dragout.

Varying characteristics in oxidizing agents present a factor that warrants serious thought when selecting a steel-blackening process. Most of these chemicals impart a satisfactory finish to soft, low-carbon steel, but some, however, fail to produce the required result in those cases where heat-treated special alloys are being fabricated or where volume output is essential. In addition, with some, the temperature range is also more critical than with others. Again, there is a decided difference in penetrating ability which, in turn, is reflected in the durability and rust-resistance qualities obtained.

Oxidizing salts are supplied in either powder or cake form. Powdered salts are made by mixing mechanically the chemical ingredients; cake salts are produced by fusing the several constituents in a furnace and then casting them in molds. Replacement of oxidizing baths is not ordinarily required since dragout loss is made up with additional salts. If operated beyond recommended temperature, the bath may be burned and weakened; if this temperature is excessive for a prolonged period, the bath may be ruined.

Contamination occasionally causes trouble. This is particularly true where copper or brass baskets or racks are used or the processing of brazed parts is involved. Wherever this problem develops, a compound designed to neutralize copper contamination without adversely affecting the oxidizing bath should be employed. To remove excessive accumulation of solids in suspension, one leading manufacturer furnishes users of his process a simple patented clarifier device without cost.

Besides producing a uniform finish with high pentration and therefore increased durability and rust resistance, certain non-critical, low-temperature, fused salt oxidizing treatments for steel are noteworthy for another vital reason; they do not cause practical dimensional changes in parts processed so that no allowance need be made for build-up, even with parts that must be held to extremely close tolerances. This is due to the fact the black finish produced by these techniques is not a coating but a chemical change in the surface of the steel itself. The finish cannot chip or peel.

During the early days of the war, many airplane motor makers quickly discovered that such processing as mentioned above provides for the

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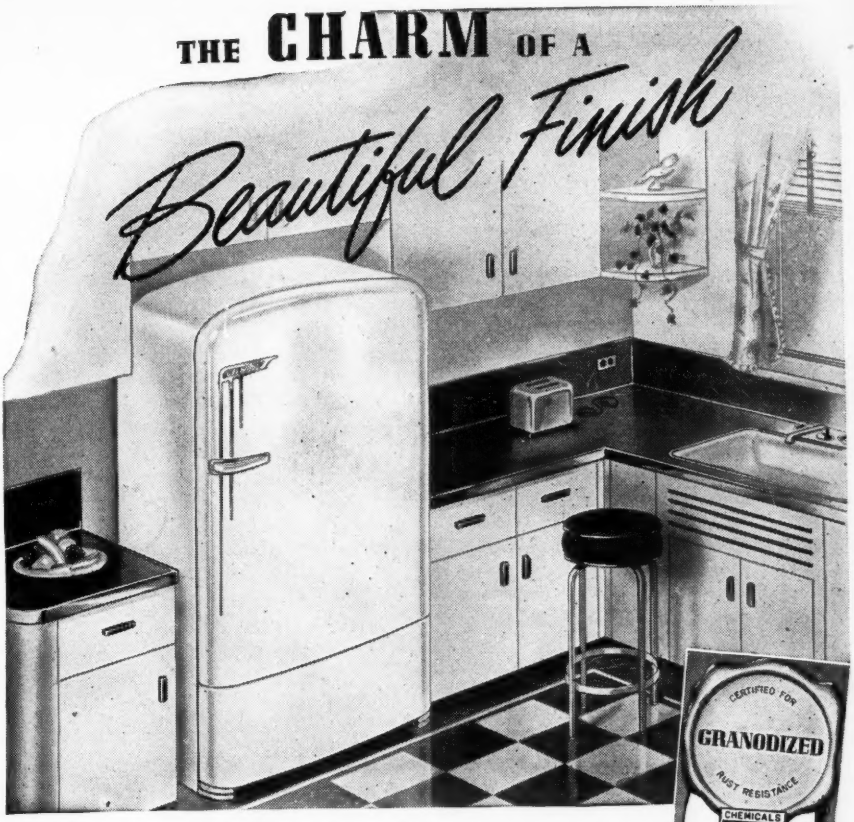

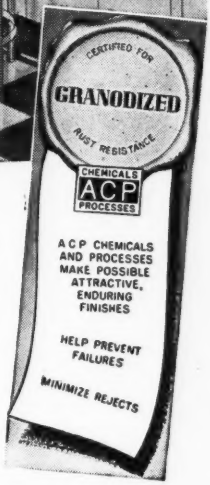

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rounding off of microscopic sharp corners present on even highly polished steel surfaces and for the production of a layer of oil-absorbing iron oxide —a combination that results, these plants further found, in lowering the coefficient of friction in close-fitting bearings. The use of a black oxide finish of this type on steel bearings to prevent galling and scoring during break-in periods accordingly increased many fold.

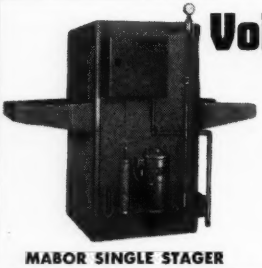
Where maximum rust resistance and durability are paramount considerations, many manufacturers employ the double-bath process in finishing parts of certain steel alloys and heat-treated parts. With this process, the work is cleaned, rinsed, and processed in one tank, rinsed, and then transferred to a second bath with operating temperature of 310 to 315 deg. F., where the work remains for the same period as in the first bath. Following this second processing, the parts are rinsed and oiled or dried in the regular manner. In some applications, it is practical to transfer workpieces directly from the first bath to the second bath without an intermediate rinse. With the elimination of dragout in the intermediate rinse, a saving of salts is effected.

Copper Finishing

Having become increasingly popular in recent years, the black finishing of copper and its alloys is by no means new. A number of blackening procedures have been used from time to time for doing this work but, for one reason or another, have not always proved entirely successful. A major advance in the chemical finishing of copper and copper alloys has been made with the recent development of a highly improved process that provides for the production of an excellent finish with a minimum of difficulties. The coating produced is very adherent and protects the base metal to a high degree against corrosion. It also is absorptive, so that oiling materially increases corrosion resistance. The material is said to serve as an excellent undercoating for organic finishes.

This relatively new copper oxidizing treatment, while intended primarily for copper, has also been found to provide satisfactory results on copper alloys containing not less than 70 per cent copper. Actual processing is simple. Effective surface preparation is the first step; mechanical and chemical cleanliness is a "must." Following alkaline cleaning or solvent degreasing, the surface is generally activated with an acid bright dip, then blackened from 10 to 30 minutes in a water solution made up with "Cu" salts, with the bath operating at a temperature between 140 and 200 deg. F. Rinsing, drying, waxing, or oiling round out the finishing cycle.

If a gloss black is required, parts



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should be polished before processing No etching is necessary in this case. For most work, however, a better finish results if the work is etched and a uniform crystalline surface produced. Thorough rinsing should follow since acid solution carry-over on parts destroys the blackening action of the Cu bath. Drying of large parts is usually effected with a hot water rinse. For small parts, tumbling in dust-free sawdust containing a trace of oil is recommended.

Chemical Finish

The steadily expanded use of brass and bronze over copper parts in late years has, until recently, presented a difficult finishing problem. Because of the limited copper content of these alloys, satisfactory blackening could be obtained with various oxidizing treatments only when parts were first copper plated. Even direct oxidation did not prove completely satisfactory since the alloying metal weakened the oxidizing bath, necessitating frequent renewal. High finishing cost was the result.

To solve this problem, one progressive manufacturer engineered, after long research and countless experiments, a new predip technique which, used in conjunction with the same processing routine outlined for copper, successfully provides for the blackening of almost all copper alloys without resorting to preliminary copper plating. Overcoming the obstacles previously encountered, this development provides for an increase in the life of the oxidizing bath, a reduction in total finishing time, and other notable advantages.

Brass and bronze parts to be black finished by this process are prepared by cleaning and bright dipping according to the usual methods, and are then subject to a "Cuprep" predip. After a three-minute immersion, during which

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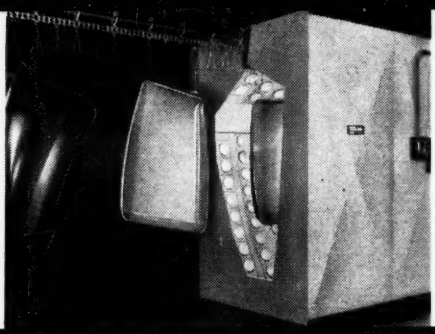

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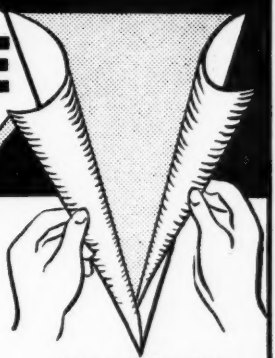

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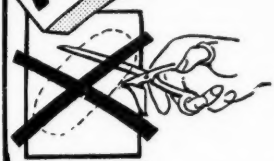

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the color of the surface of the alloy changes to dark gray or grayish-purple, the work is removed, rinsed, and "Cu-treated." In this latter solution, parts oxidize rapidly to the desired jet black. The standard procedure for completing the black finishing of copper follows.

Zinc Finishing

Of the many processes as well as solutions of permanganates, chlorates, or molybdates employed for black finishing zinc and zinc alloys, the latter have been found to show considerable promise of consistent success. Of these, the simplest and most effective has proved to be a salt properly buffered for stability but still sufficiently active to produce a coating molybdenum sesequioxide on zinc or cadmium.

In common with other chemical finishing treatments, the work must be thoroughly cleaned before oxidizing by this method. This may be accomplished by any of the more widely used methods previously mentioned. When alkaline cleaning is utilized, parts must be thoroughly rinsed, first in hot and then cold water, to remove all traces of cleaning solution. Otherwise, subsequent alkali contamination will upset the balance of the processing bath Surface preparation in many instances also includes scratch-brushing or buffing with a greaseless compound before chemical cleaning.

The work is then placed for three minutes in the processing bath—a water solution of the special molybdate salt operated at a temperature ranging from 140 to 200 deg. F. When zinc plated parts are to be blackened, they should be processed immediately after plating and rinsing whenever this is practical. Such parts are absolutely clean and the surface is free from oxide. If immediate processing is not feasible, the work must be subjected to a regular degreasing procedure.

Die castings require through cleaning as well as predipping before immersion in the coloring bath. Should examination of the work after blackening reveal an imperfect coating due to surface impurities in the metal, the parts are redipped in acid pickle and reprocessed. Immersion required to remove the remaining impurities usually does not harm the deposit of black.

After coloring, the work is dried, waxed, or lacquered. The attractive metallic oxide produced, satisfactory for normal use by virtue of its strong adherence and unusual wear resistance, is not recommended for constant exposure to the weather unless protected by lacquer. As a base for organic coatings, it prevents chemical action between the coating and the base metal which frequently causes blistering, peeling, and flaking when lacquer or paint is applied directly on zinc.

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lems are exactly alike. In actual practice, in fact, they vary widely in scope from plant to plant. For this reason, it is a wise policy for any plant or shop encountering trouble in obtaining the chemical finish desired to call in a service engineer thoroughly familiar with the installation, operation, and maintenance of black oxide finishing setups.

Among the suppliers of chemicals for producing the finishes on steel, copper, brass, bronze, zinc, and zinc alloys described are those who maintain competent field service staffs, comprised of technically trained men whose primary function is to personally help a manufacturer find the right answer to his individual chemical finishing problem. The free services of such concerns include recommendations as to whether the finish is suitable for the application in question, blackening for inspection and approval product samples finished with the suggested coating, and advice as to equipment needed to handle the production required. Because of their extensive specialized experience, these organizations can provide correct working instructions to the operator concerning the most effective and economical procedure for handling the particular type of metal to be finished.

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Finishing Clinic

By DR. ALLEN G. GRAY

•

A Monthly Digest on Current Technical Progress Indicating Significant Trends and Developments in the Finishing Industry

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THIS MONTH . . . Finishing Zinc Alloy Die Castings . . . Buffing and Polishing Magnesium . . . Influence of Surface Structure of Steel on Quality of Galvanized Coatings . . . Protection of Workers Against Solvent Health Hazards . . . Effect of Cleaning on the Corrosion of Steel . . . Selection of Baking Oven for Organic Finishes.

Finishing Zinc Alloy Die Castings

SO important has been the development of proper finishes for zinc alloy die castings from the appearance and sales angles that if they were not available, it is likely that the total production of such castings might be half that made today. It is significant for the finishing engineer to note that four distinct types of finishes are available for use on zinc alloy die castings: (1) chemical treatments, resulting principally in chromate and phosphate conversion coatings; (2) electroplated finishes, which usually involve the primary plating of copper followed by what other metal may be desired; (3) organic finishes applied by spraying, brushing or dipping; and (4) plastic finishes.

Where appearance is a factor, or where corrosion products may cause trouble, if their formation is not inhibited, some type of surface finishing treatment is usually desirable and sometimes is essential for zinc die-cast parts. For external surfaces, an organic finish, such as enamel, is commonly sufficient, but still better protection is afforded if the surface is given a chemical treatment of the proper kind before the organic finish is applied. Where interior passages or working fits are involved, or where for any reason corrosion must be inhibited either with or without an organic coating, certain chemical treatments are highly effective.

Chemical Treatment. Chemical treatments are most often applied to prepare surfaces for subsequent organic coatings and markedly improve the adherence of such coatings. However,

many yield a coating that has in itself a considerable degree of corrosion resistance whether coated subsequently or not. Several inhibit the spread of corrosion when finishes are scratched through to the base metal or chipped. Some provide colors that are satisfactory for certain uses as final finishes.

There are three established proprietory treatments of the **chromate** type known respectively as Cronak (The New Jersey Zinc Company); Iridite (Rheem Research Products, Inc.); and Anozinc (United Chromium, Inc.). All of these treatments can be used either alone or as pretreatments for subsequent organic coatings. Cronak and Iridite require only immersion of the parts treated. Anozinc is an electrolytic treatment. None of the treatments alter the dimensions of the work being processed significantly.

Phosphate treatments result in phosphate coatings that inhibit corrosion and are chemically united with the metal of the die casting. Proprietory treatments of this type are available as Parkerizing and Bonderite (Parker Rust-Proof Company) and Lithoform (American Chemical Paint Company). Since the phosphate coatings formed have an interlocking crystalline structure, they make an excellent base for enamel, paint, and similar organic film forming finishes. The adherence of such finishes is not only promoted by mechanical means but by reason of the tendency of the phosphate coating to inhibit chemical reaction, such as sometimes occurs otherwise, between ingredients of the finish and the chemically active zinc of the casting. The phosphate treatment is reported to be particularly valuable to improve paint adherence where the coating is to undergo outdoor exposure (also see "Die Casting," Nov. 1945).

Electroplated Finishes. Although several of the metals commonly employed in plating can be coated directly on zinc, superior results are secured when the initial coat is copper. Coats of copper and nickel are commonly used under chromium. Fairly heavy coats of copper followed by nickel in about equal thickness and then by a flash of chromium are almost invariably specified for bright exterior hardware, grills, and other die-cast zinc parts for automobiles. Similar specifications, but usually for somewhat lighter coats, are used on hundreds of die-cast zinc parts for interior applications. Some zinc die castings, especially flashlight reflectors, are plated with silver and some, such as razor parts, are gold plated. In both cases, a primary coat of copper is used. Many zinc die castings, especially for the hardware trade, are plated with brass. This coat sometimes is a yellow or golden color and sometimes a bronze color.

Organic Finishes. Many organic finishes suited for use on other metals are also satisfactory on zinc die castings. Optimum results are usually secured when the coating is given one of the chemical "pretreatments" already discussed. However, entirely satisfactory results can be obtained when the proper type of primer, especially of the zinc chromate type, is applied in place of pretreatment. There are enamels available that provide a satisfactory finish for some purposes on zinc die castings in a single spray coat although a more enduring finish and one of better appearance results when more than one coat, of which the first may be a primer, is employed.

Satisfactory results are possible with nitrocellulose lacquer enamels, especially where rapid air drying is desired, but other air drying enamels are also available. With organic materials, such as synthetic enamels, the most enduring finishes are usually attained by baking at controlled temper-

Table I—Typical Procedures for Polishing Magnesium Alloys

Operation	Abrasive	Type Wheel	Wheel Diam. inches	Wheel Speed f.p.m.	Remarks
Rough Polish	60 to 100	Canvas, Sheepskin or Felt	6 to 12	3000 to 5000	Required only for Rough Surfaces such as Sand Castings. Grease Stick may be used
Medium Polish	100 to 200	Built Up Cloth	6 to 12	4000 to 6000	Grease Stick may be used
Dry Fine Polish	Dry Compound	Loosely Sewed Buff	6 to 12	3500 to 5000	— — — —
Buffing	Tripoli	Loosely Sewed Buff 74 to 82 Count Cloth	10 to 14	6000 to 8000	— — — —
Coloring	Dry Lime	Canton Flannel Buff	12 to 16	8000 to 12000	Minimum Pressure to produce best luster

atures. Composite finishes, such as clear lacquer over silver plating, or the application of enamel in recesses or over other areas of a plated casting, are frequently employed to prevent tarnishing or to provide pleasing contrasts. Wood-grain finishes are sometimes used on die castings, oftentimes in conjunction with plated finishes.

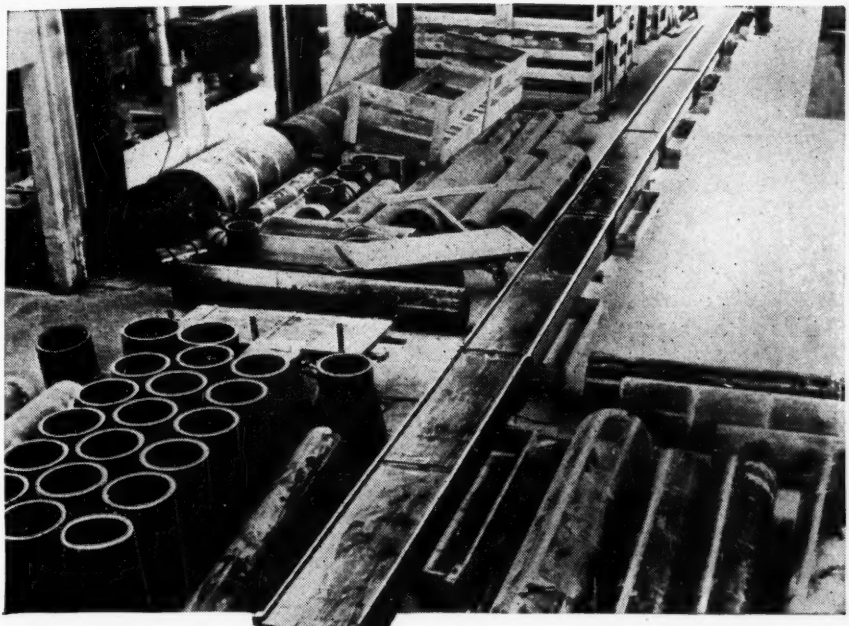
Plastic Finishes. Finishes consisting of a thick coating of plastic that is usually either transparent or translucent are sometimes applied to zinc die castings. Such finishes are usually cellulose nitrate, cellulose acetate, or ethyl cellulose ("Product Engineering," May 1946). True plastic finishes are similar to plastics used for molding. One method of application is to injection mold a coating around the die casting. This provides a part which appears to be molded entirely from plastic, yet has the strength and shock resistance of the die casting. More extensively applied, however, especially on interior parts, is the method by which the plastic is repeatedly dipped in or sprayed with the plastic reduced to liquid form. When properly applied, these plastic coatings provide unusual finishes possessing good appearance and long life.

* * *

Buffing and Polishing Magnesium

POLISHING and buffing are sometimes used in the finishing shop to produce an attractive bright metallic luster on magnesium. If protected with a clear lacquer, this type of finish has limited application for decorative purposes. Buffing of magnesium is most frequently used, however, as a preliminary step prior to plating or chemical coloring. Although the requirements for individual jobs may vary a great deal, Table I, prepared by The Dow Chemical Company, may provide helpful instructions to the finishing engineer interested in the production buffing of magnesium.

In conjunction with the consideration of polishing and buffing procedures for magnesium, the finishing



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engineer should also keep in mind the fact that oxide, dirt, and the like can be removed by other mechanical means such as wire-brushing, sanding, sand-blasting, and shot-blasting. These last two, while very efficient and economical methods of surface treatment, are very undesirable on magnesium if maximum resistance to salt water is desired. Surface contamination as a result of the treatment causes accelerated corrosion. A pickling treatment should always follow sand or shot-blasting, since the removal of 0.002 inch or more of metal surface eliminates the detrimental effect. This is clearly shown by the illustrations in Fig. 1, which show painted test panels after one month in the salt water test.

A satisfactory pickling procedure consists of immersing the parts for 10 to 15 seconds at room temperature in a bath containing by volume 8 parts of concentrated nitric acid, 2 parts of concentrated sulfuric acid, and 90 parts of water. This nitric-sulfuric acid pickle must be applied before any machining since the amount of metal removed is likely to exceed machined dimensional tolerances. It is quite safe, however, to pickle rough, unmachined castings and heavy sections.

* * *

Influence of Surface Structure of Steel on Quality of Galvanized Coatings

THE metal finisher dealing with hot-dip galvanizing operations should keep in mind that the surface structure of the steel base is an important factor in the process of galvanizing, especially in sheet galvanizing procedures (also see "Sheet Metal Industries," Dec. 1945). The best medium for the process appears to be the surface of a correct box annealed sheet. If the surface be pitted by overpickling or even very smooth

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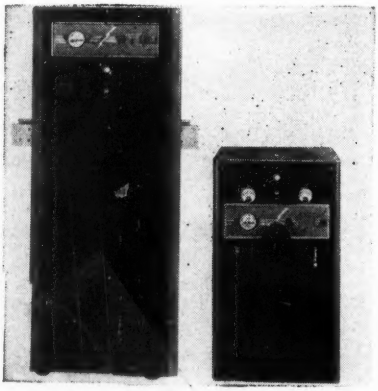

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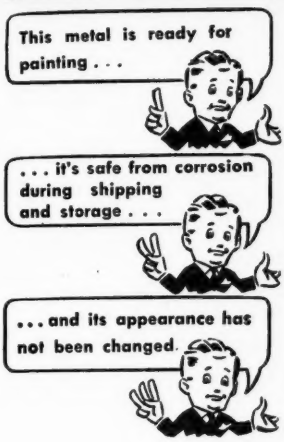
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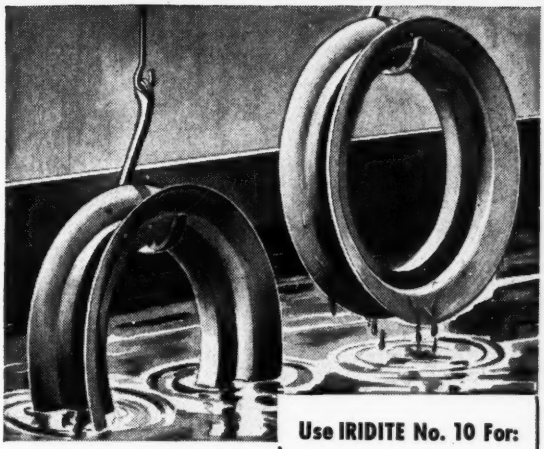

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A quick dip in *uniquely colorless* Iridite No. 10 prevents unsightly and costly corrosion during shipping and storage periods . . . makes an ideal paint base for the final fabricator . . . leaves the metal's appearance unchanged, even to the spangles in galvanizing.

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by cold rolling or the use of certain inhibitors, the influence of surface structure is detrimental. When a poorly annealed or dirty steel is overpickled, the surface is pitted, dirty, and covered with scum, and consequently the galvanized product is dirty and gray. When underpickled, especially in the case of well annealed sheets, the surface will be skinned and white.

To give flatness, steel sheets are sometimes cold rolled before galvanizing; sometimes in the case of thin sheets, grayness is produced and with thick sheets, whiteness and skinned surfaces are caused. It has been found in a number of operations that fully annealed sheets are more likely to skin than moderately annealed sheets, and cold rolling appears to increase the tendency to skin. One theory that has been advanced is that the iron-zinc alloy formed on large ferrite grains, unless they are deeply pitted, is of a less adherent and coherent form tending to disperse in small grains the adjacent zinc, thus reducing the fluidity of the coating carried from the bath and interfering with free crystallization and spangle formation.

Sometimes when certain inhibitors are used in pickling tanks, prior to galvanizing, skinned surface is prevalent and the coating is liable to peel. Certain types of steel, such as high silicon steel, have been found difficult to galvanize even in certain cases after special pickling procedures have been used. Extremely smooth surfaces, produced by cold rolling, are difficult to galvanize without whiteness. One explanation is that after cold rolling the inclusions project and form crystallization nuclei. Thus, it appears that certain conditions of the surface structure of steel will retard the interaction of iron and zinc and hinder proper spangle formation in the hot-dip operation and certain other conditions will promote grayness.

* * *

Protection of Workers Against Solvent Health Hazards

WORKERS in the finishing room where volatile organic solvents, including gasoline, benzene, naphtha, carbon tetrachloride, and trichloroethylene, are used in cleaning, degreasing, and other operations can be protected from the effects of inhaling excessive amounts of fumes by means of proper ventilating equipment.

According to the Safety Research Institute, New York, basic protection should be provided by keeping the concentration of solvent vapors in the general atmosphere of the work room below "the maximum allowable concentration (M.A.C.) for continuous exposure". This limit, which represents the maximum concentration of solvent vapor to which workers may

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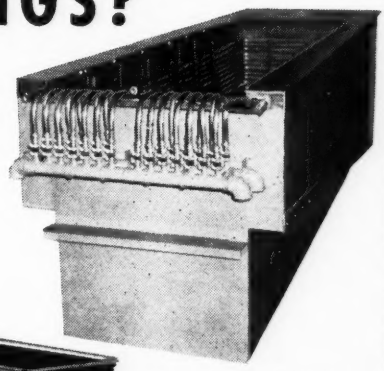
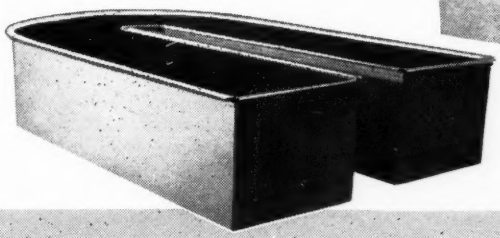


Sulphuric Acid Anodizing Tank



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be continuously exposed during the eight-hour work day, has been established by the American Standards Association for several of the commonly used solvents, but many states have standards of their own. The limits vary from 50 parts of solvent vapor per million parts of air for benzene to 1,000 parts per million for petroleum products unmixed with more toxic substances. Solvent users can obtain M.A.C. tables from the Industrial Hygiene Departments of their respective states, or in states without such departments, from the U. S. Public Health Service, Washington, D. C.

Natural ventilation may suffice to provide this basic protection where the contamination of the atmosphere is slight, as where the solvent is being used in small quantities or is applied in equipment that prevents the escape of vapor. In other cases, it may be necessary to employ some form of mechanical ventilation, such as a local system which will draw off the vapors as they arise or strong general ventilation which will rapidly dilute the vapors to a safe level.

However, even where the workers as a group are effectively protected by these measures, certain practices to be avoided are the following: (1) using solvents in poorly ventilated areas, such as small rooms, basements, pits, and so on; (2) working over open containers of solvents and handling products damp with solvents; (3) opening containers or equipment holding solvents in such a manner that high concentration of the vapor is inhaled and permitting drafts to blow solvent vapors in the direction of workers.

* * *

Effect of Cleaning on the Corrosion of Steel

MOST finishing men realize that in the cleaning of bright, machined steel surfaces, or bright sheet steel, and of polished iron or steel, it is highly desirable that the metal does not rust before the next operation. The succeeding operation may be inspection, further machining, assembly, painting, Bonderizing, or just storage. Many times steps in processing do not follow in rapid succession after the cleaning step and consequently appreciable rusting may occur in the industrial room atmosphere which surrounds them. The rust may be injurious to the part and equally as undesirable as the original soil of dirt and oil.

At the opening session on corrosion at the 89th Convention of The Electrochemical Society at Birmingham, Alabama, held April 11-13, Chester W. Smith of the Detrex Corporation, Detroit, discussed the effect of cleaning methods for steel on the corrodability of the surface with exposure to the normal elements present indoors in industrial atmospheres. "Clean" steel does not exist in ordinary atmospheres

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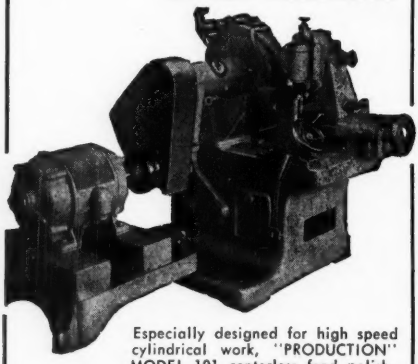

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. . . but BUNATOL No. 785 is even tougher when it comes to withstanding the hot alkali cleaners, strong acid and alkali solutions and careless handling that electro plating racks and fixtures must withstand in decorative plating today — Copper, Nickel and Chrome.

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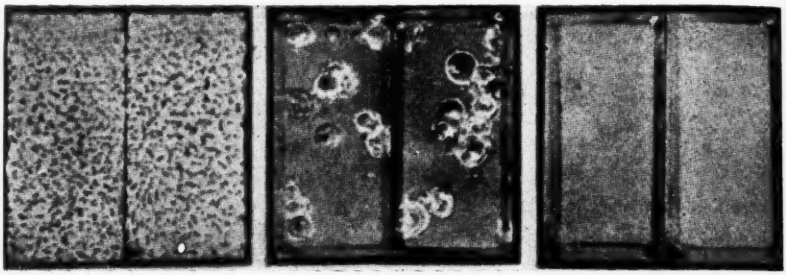
Painted Magnesium Panels After 1 Month in Salt Water Test



Sandblasted | Sandblasted and Chrome Pickle | Sandblasted + Acid Pickle + Chrome Pickle

Treatment	Rating
Sandblast	Poor
" + Chrome-Pickle	Fair
" + Acid Pickle + Chrome-Pickle	Good

NOTE: Acid Pickle.....15 seconds in 8% HNO_3 + 2% H_2SO_4
Paint Schedule.....2 coats Navy P-27 primer
2 coats Navy V-10 varnish + 1.5 lb. per gallon alumium powder

TEST — 1 month alternate immersion in 3% NaCl at 95° F.

Fig. 1—Effect of pickling on corrosion resistance of sandblasted magnesium

because oxidation occurs almost instantaneously. It is possible, however, according to Smith, to clean the surface of steel and leave a film of the cleaning material which will act as a diffusion barrier in preventing initial oxidation and yet fulfill the requirements for its subsequent use. Cleaning methods using either abrasives, or alkaline compounds, or volatile or partially volatile solvents, and emulsified solvents were compared as to effects on bright steel, when exposed in an "acidic atmosphere cell".

The "acidic atmosphere cell" devised by Smith incorporated many of the significant factors present in regularly encountered shop atmospheres, such as moisture, acidic gases, oxygen, and temperature variations. On the basis of these tests it was found that emulsified solvent cleaning materials which leave a film of non-volatile emulsifier render steel surfaces the least corrodible. Steel cleaned by such materials can usually be further processed by inspection, machining, Bonderizing, or painting without any additional cleaning step and may be held over for indefinite periods without corroding in an industrial atmosphere.

* * *

Selection of Baking Oven for Organic Finishes

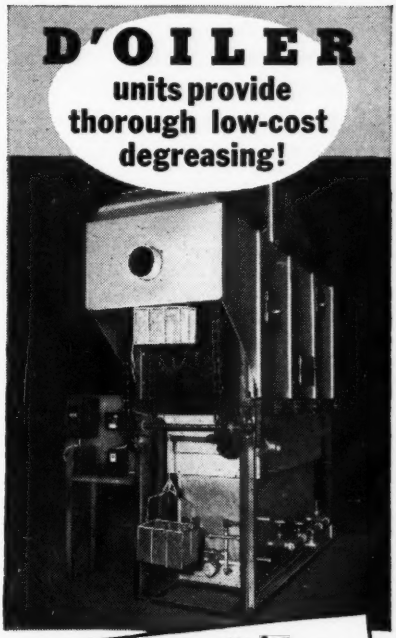
THE type of baking operation to be used in organic finishing is gov-

erned by the principle of heat transfer involved, such as convection, radiation, or induction. Convection and radiant heating are the methods principally used.

Convection ovens may be heated by steam, oil, gas, or electricity, although oil or gas are most commonly used. In the case of oil or gas fired ovens, either direct or indirect fired ovens are available. Experience in general, has indicated that the direct fired ovens are satisfactory for primers and undercoats. The indirect fired type ovens have been found generally satisfactory for primers, undercoats, and finish coats.

Radiant ovens are those which derive their heat energy from infra-red rays produced either by special infra-red electric lamps or special infra-red gas burners. The most efficient installations of this type are enclosed to take advantage of the convection heat that is also available. A characteristic of infra-red heat energy is its ability to develop rapid temperature rise on the part being heated. This varies with the reflectance of the color of the finish, the temperature rise being more rapid with dark colors than with whites and light colors because of this fact. The radiant type of baking has caused considerable interest in so-called "short" baking schedules of 15 minutes or less as contrasted with normal baking schedules of 30 minutes or over.

In some recent oven designs, radiant heat is used as the first stage of a normal convection oven to hasten the metal temperature rise of the part being heated in order to reduce the baking time. In others, this is being accomplished by the use of high turbulence convection ovens in which the air velocity is increased from the normal 30 to 60 changes per hour to something like 300 changes per hour.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New Lacquer Plant Opened in Carteret, N. J.

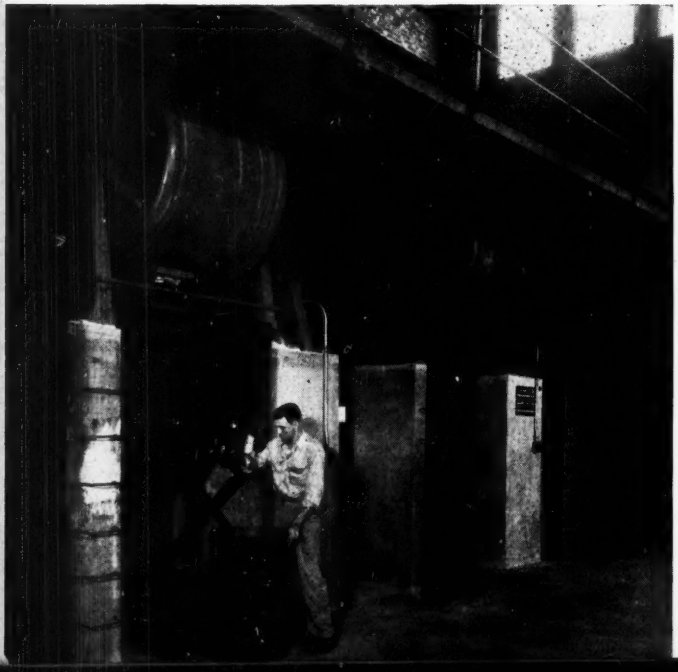
A LARGE, modern lacquer plant was opened in Carteret, New Jersey, on June 13th, by the Organic Coatings Division of United Chromium, Incorporated. This new plant is located among the buildings of the Metal and Thermit Corporation, of which United Chromium is a subsidiary. It replaces the lacquer plant United Chromium formerly operated in Waterbury, Connecticut.

The working area of the new plant is 22,500 square feet, and its present production capacity is approximately four times greater than that of the Waterbury plant. In designing the structure, emphasis has been placed on efficiency, safety and simplicity of operation with provisions made for future expansion as business continues to increase.

Main floor and mezzanine type of manufacturing is a feature of the plant. Raw materials are lifted to the mezzanine by a crane and an electrically-driven hoist from where they are fed into the pebble mills. The mills are unloaded on the main floor. All floors in this manufacturing section are of the sparkproof, conductor type.

Fire control equipment includes a fully automatic, carbon dioxide fire protection system. In addition, there is a full twelve-inch fire wall separating the manufacturing section from the dry materials storage and laboratories section. The automatic fire protection system is put into operation by actuating bulbs whenever there is an unusually sudden rise in temperature. All windows are automatically closed, electric power cut off, and ninety nozzles go into action, filling the mixing tanks and rooms with enough carbon dioxide to extinguish a fire in a matter of seconds.

A large portion of the volatile solv-

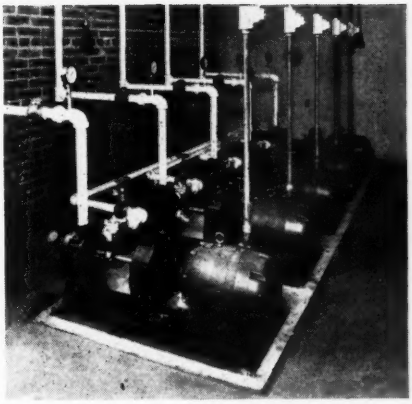


Pebble mills are loaded from the mezzanine and unloaded into portable tanks on the main floor of the plant.

ents are stored in five 5,000-gallon outdoor storage tanks. They are pumped directly to transfer tanks placed on the weighing platform in the mixing room. After the transfer tanks have been filled they are transported to the mixing tanks by a sixty-foot span overhead crane.

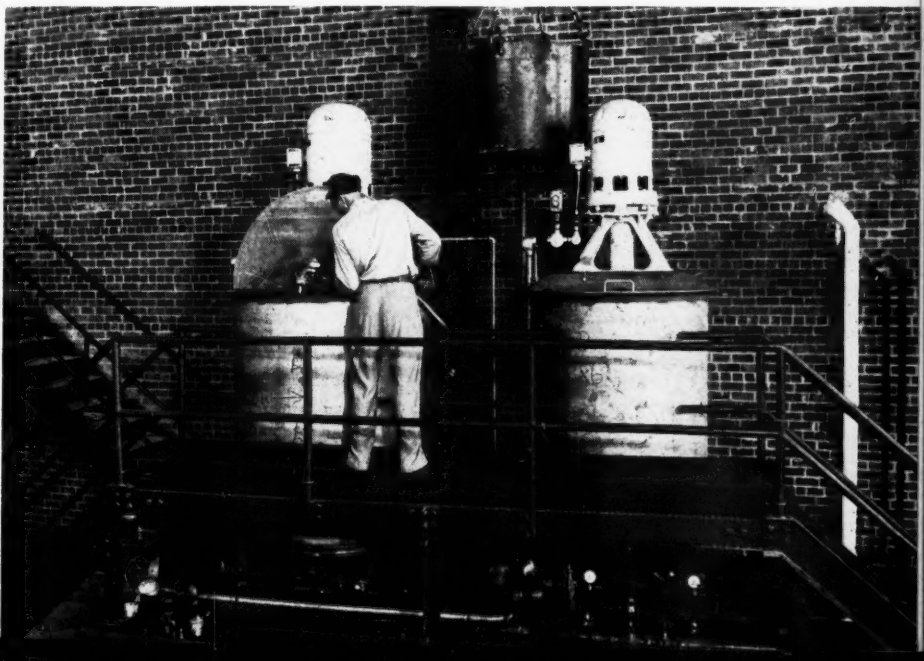
The plant includes a testing laboratory, air-conditioned laboratory, general research laboratory, heavy equipment laboratory, analytical laboratory, and service laboratory. The testing laboratory includes such equipment as a six-foot water-wash spray booth, a six-foot drying room, a lacquer dipping machine, a large infrared drying bank, a salt spray testing cabinet, and a humidity cabinet. The air-conditioned laboratory is equipped for close control of the humidity as well as the temperature.

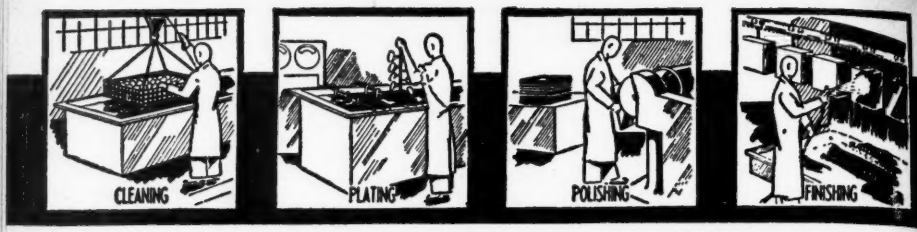
The new plant will be managed by F. L. Scott who has been managing United Chromium's Waterbury plant since 1944. A. E. Whitney, who was with Du Pont for five years, has been named production manager. The supervisor of technical service is D. R. Meserve, who formerly held the same position at Waterbury.



This battery of automatic pumps is used to transfer solvents from five outdoor 5,000-gallon tanks to weighing platform.

High speed mixers are employed to quickly and uniformly mix the lacquer ingredients. Materials are transported to the mixers by a 60-foot span overhead crane.





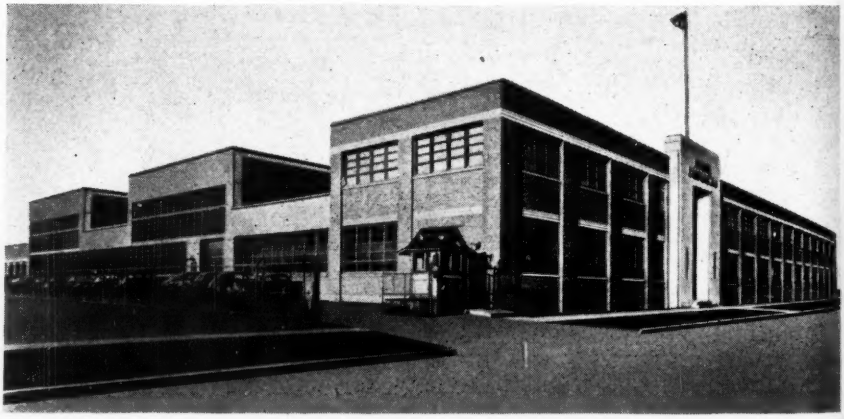
News of the Industry

Detrex Corporation Announces New Location

To meet increased sales volume due to the widespread use of Detrex metal cleaning equipment and chemicals by the automotive, aviation, and other metal-working industries, the Detrex Corporation is now occupying its new modern main plant and offices at 14331 Woodrow Wilson, Detroit, Michigan. As a part of its large expansion program, this plant will widen the scope of personalized service offered by Detrex to all industrial plants having cleaning departments. Increased production facilities will enable the company to speed delivery on all types and sizes of Detrex degreasing equipment and metal parts washers.

Administrative, sales, purchasing, advertising, public relations, manufacturing, accounting, and legal functions will all be handled at the new location, the mail address being P. O. Box 501, Detroit 32, Mich. The former main plant on Hillview Avenue is being converted to fabricate equipment and market chemicals used by the dry cleaning industry.

Officers of the Detrex Corporation are: R. A. Emmett, president; A. O. Thalacker, vice president and general manager; G. E. Powers, treasurer; E .W. Allison, secretary; C. F. Dinley, vice president in charge of engineering and research; W. W. Davidson, vice president in charge of sales.



New main plant and office building of Detrex Corporation

Mitchell-Bradford Reincorporates

Mitchell - Bradford Chemical Co., 2446 Main St., Stratford, Conn., manufacturer of "Black Magic" blackening processes, "Silco," a glass-base, sprayed and baked coating, and also heat treating materials, has reincorporated as The Mitchell-Bradford Chemical Company. The officers of the corporation are A. J. Mitchell, president; J. W. Mitchell, vice president; and M. F. Mitchell, secretary and treasurer.

A. J. Mitchell has been active in the management and chemical research of the company and is a founder of the original company. He is the principal stockholder in the new corporation and will continue the active management of it.

The main offices and plant are located in Stratford, Connecticut. The company also maintains a mid-western office in Chicago, Illinois, under the supervision of William H. Price, Jr. The company has warehouse stocks in Cleveland, Chicago, and San Francisco, with representatives spotted in strategic areas throughout the United States and Canada, as well as in foreign countries.

Dr. H. R. Copson Awarded Charles B. Dudley Medal

The nineteenth award of the Charles B. Dudley Medal of the American Society for Testing Materials was presented to Dr. Harry R. Copson, research chemist with the Bayonne Research Laboratory of The International Nickel Company, Inc., during the annual meeting of the Society held at the Hotel Statler, Buffalo, N. Y. John R. Townsend, president of the Society, made the presentation. The award is given for the outstanding paper of the year involving original research and was in recognition of Dr. Copson's paper on "A Theory of the Mechanism of Rusting of Low Alloy Steels in the Atmosphere".

Dr. Copson graduated from Massachusetts State College with a B.S. degree in 1929, and from Yale University with a Ph.D. in physical chemistry in 1932. After serving as chief chemist with the Apothecaries Hall Co., Waterbury, Conn., for more than a year, Dr. Copson joined the research laboratory of International Nickel at Bayonne in June, 1934. As a research chemist, he has in recent years been connected with the Chemical and Corrosion Section of this laboratory.

Dr. Copson has written numerous technical articles and papers dealing with the corrosion of metals.

Named Eastern Sales Manager

John R. Kauffman, recently returned from the U. S. Navy, has been named eastern sales manager of the Allied Engineering Division of Ferro Enamel Corp., Cleveland, Ohio. He will have offices at 17 E. 42nd St., New York, New York.

John R. Kauffman

Mr. Kauffman is well known in the ceramic and tile industries. Following graduation from Rutgers University with the degrees of B.S. and M.S. in ceramics, he was employed for three years at a brick plant in Ohio. In 1931 he returned to Rutgers to join the research and teaching staff as professor in ceramics, remaining there until in 1940 when he joined the Allied Engineering Division as eastern representative.

Personnel Changes

The Gaybex Corp., Nutley, N. J., announces the appointment of C. F. Rowlands, formerly with the Wright Aeronautical Corporation, as sales manager in charge of the Domestic Wholesale Sales Department.

J. J. Parker of Norfolk, Va., has been appointed district sales representative for the state of Virginia. W. A. Church has joined the home office sales staff in northern New Jersey; and Sidney E. Newman, formerly with the Warner Brothers Company, will join the Harris Pump & Supply Company, western Pennsylvania distributor for the Gaybex Corporation, as resident factory representative in Pittsburgh.

Become Atlas Directors

W. G. Frome and T. M. Eliason have been elected members of the board of directors of the Atlas Powder Company, according to an announcement by Isaac Fogg, president. Mr. Frome started in

W. G. Frome

the explosives industry in 1910 and served in managerial positions at various Atlas explosives plants, finally becoming general manager of Atlas' Giant Division, San Francisco, Calif. Later he was transferred to Wilmington and appointed

T. M. Eliason

assistant general manager of the Explosives Department in 1943 and general manager last year.

Mr. Eliason joined Atlas as chief clerk in the accounting department in 1913 when the company was organized. He became comptroller in 1922, assistant treasurer in 1927, and last year was elected treasurer.

Joins Turco Technical Service Staff

Turco Products, Inc., manufacturer of cleaning and maintenance compounds for industry, announces the affiliation of Donald Keating with its technical service staff. A graduate of U.C.L.A. and Cal. Tech., Mr. Keating served in the Navy as executive officer on an LST during World War II.

Mr. Keating joins Turco as a technical service representative and will specialize

Donald Keating

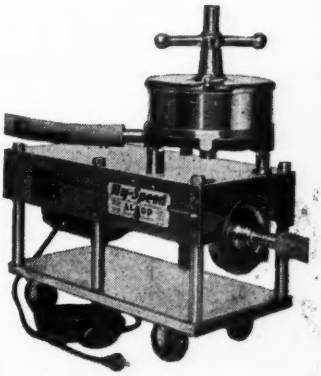
in the solution of problems relative to cleaning and maintenance in the general industrial field.

Merchants Chemical Company

Formation of The Merchants Chemical Co., Elm Court, Stamford, Conn., is announced by Victor F. Mutch, president. Mr. Mutch was formerly president of the Cordo Chemical Corporation.

The new company will be devoted to the manufacture of industrial coatings and finishes, including "Co-Res-Co" corrosion resistant maintenance coatings, "Cordo-Clad" plastic base metal finishes, and "Cordo-Flex" plastic strip-type coatings.

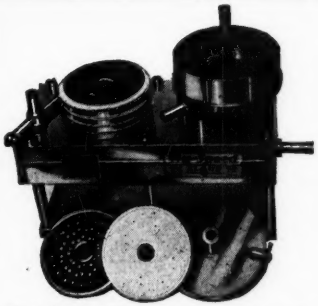
INVESTIGATE THE "Sealed-Disc" FILTER FIRST



A Quarter Century of development and research in the filtering of plating solutions have contributed many features which make the *"Sealed-Disc"* Filter outstanding.

They are doing a remarkable job in plating rooms all over the world assuring finished work in faster time, with fewer rejects.

Many platers insist on Alsop's *"Sealed-Disc"* Filters—and that's why we suggest that you investigate them first.



Note how easily internal parts can be removed for cleaning.

NOTE THESE 4 FEATURES

1. Completely enclosed, air-tight unit, eliminating loss through leakage or dripping. No filtering powders required, or slurry mixing tanks needed.
2. Exceptionally small space requirement. For example, a 600 gals. per hour filter complete with electric pump requires only a 9" x 20" floor space—a 2000 gals. per hour machine requires only 12" x 24" of floor space.
3. Filter discs can be changed quickly and easily even when changing from one solution to another. *Anyone can do it in a very few minutes.*
4. Made in sizes, with or without pumps, from 1 gal. per minute up to thousands of gals. per hour.

Our Engineering Service plus our Laboratory facilities have been very helpful to many of our customers. Perhaps we can help you, too. We'd like to try. Just write us, or contact your favorite plating supplier.

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D. C. Cooper Company Occupies New Quarters

The D. C. Cooper Company has moved into new quarters at 1467 S. Michigan Ave., Chicago 5, Ill., where it will manufacture metal cleaning tanks and washers, metal cleaning compounds, electric wax tanks, plating baskets, glue pots, and various other products and equipment for the metal-finishing industry.

The company has been serving the

New quarters of D. C. Cooper Company

metal industry for the past 15 years, starting in business in a small store at 26 E. 18th St., and adding additional space and continually outgrowing its facilities until in 1945 the present building at 1467 S. Michigan Avenue was purchased. Complete remodeling was begun on the building and spacious offices were built and beautifully decorated, with murals symbolic of the products of the company lining the walls of the reception room.

The three-story building has a floor space of approximately 50,000 square feet, with large display windows facing Michigan Avenue.

Forms Mabor Company

Marcel C. Boss, formerly on the engineering staff of the Hanson-Van Winkle-Munning Company and the Optimus Equipment Company, has formed his own organization under the name of the Mabor Company which is located at 234 West Dudley Ave., Westfield, N. J. Born in Paris in 1901, Mr. Boss is a graduate of the Ecole Centrale de Paris and started his business career by creating sisal estates in Africa. Upon completion of this assignment, he worked with the Carrier Engineering Company in France and, in 1930, he formed the Mabor Company in Paris.

In addition to running the Mabor Company during the war, Mr. Boss served as a naval officer in the 90 mm. batteries. For the past three years, he has been associated with the Hanson-Van Winkle-Munning Company and the Optimus Equipment Company. Mr. Boss will divide his time between the plant in Paris and the newly formed company in New Jersey.

R. W. Mason, Jr., Joins International Nickel

R. W. Mason, Jr., formerly with The Lithium Co., Newark, N. J., has joined the Development and Research Division of The International Nickel Company, Inc. He will make his headquarters at the Detroit Technical Section of the division on the fifth floor (5-223) of the General Motors Building, Detroit, Michigan.

Mr. Mason graduated from Michigan State College in 1937, where he received a B. S. degree in applied science, majoring in chemistry, physics, and mathematics. He served as an assistant to metallurgist in the Lakey Foundry and Machine Co., Muskegon, Mich., from June 1937 to July 1941. Mr. Mason was assistant to the general manager and chief inspector in charge of quality measures while associated with General Foundry and Manufacturing Co., Flint, Mich., from July 1941 to January 1942. His next four years were spent in the U. S. Ordnance Department, engaged in the specification of materials for, and engineering of, tanks and automotive material.

Mr. Mason will serve in the Detroit office as metallurgist and consultant to consumers and producers on the use of nickel in ferrous and non-ferrous castings.

New Sales Manager for Ferro

Glenn A. Hutt has been promoted to the position of general sales manager of the Ferro Enamel Corp., Cleveland, Ohio, and its divisions, according to an announcement made by C. D. Clawson, vice president in charge of sales and research of the company. In his new position, Mr. Hutt will have charge of sales-planning, methods and customer contacts for the Porcelain Enamel Frit, Color, Vedoc, Allied Engineering, and Ceramic Supply Company Divisions of Ferro Enamel Corporation.

Glenn A. Hutt

Mr. Hutt joined the Ferro Enamel Corporation in 1935. Several months later he moved to Australia and became director for Ferro Enamels, Pty., Sydney, the Company's Australian Subsidiary. Mr. Hutt returned to the United States in 1940 and in 1941 was appointed assistant general sales manager of Ferro Enamel Corporation and its divisions. In 1942 he joined the U. S. Army as a 1st lieutenant in the Chemical Warfare Service and was promoted to captain in 1942. He was discharged in 1945.

Mr. Hutt graduated from the Ohio State University in 1930 with the degree of bachelor of science in ceramic engineering and thereafter was employed by the Frigidaire Division, General Motors Corp., Dayton, Ohio, for four years as ceramic engineer.

METAL CLEANING *Simplified!*

PHILLIPS VAPOR DEGREASERS *give you*

- √ **68% greater flushing action.**
- √ **66⅔% less evaporation loss.**
- √ **Reclaims solvent while working . . . No shutdowns.**
- √ **Plug in and start work . . . No installation.**
- √ **Safest cleaning . . . Lowest toxicity.**

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Using **PHILLSOLV...** The Safe, High Efficiency, Premium vapor degreasing solvent.

Manufacturers of a Complete Line of Metal Cleaning Machinery

PHILLIPS MANUFACTURING CO.

3461 W. TOUHY AVE. CHICAGO 45, ILL.

Assumes Charge of Foreign and Domestic Sales

Henry K. Watson II has been placed in charge of foreign and domestic sales of the Special Coatings Division of the Watson-Standard Co., Pittsburgh, Pa. Mr.

Henry K. Watson II

Watson is a director of the company and also of the First National Bank, McKeesport, Pa. He is the third generation of his family to be engaged in the paint industry in Pittsburgh.

Mr. Watson is a graduate of Shady Side Academy and Phillips Exeter Academy. He served overseas for two years with the First Infantry Division, having left Yale University in his junior year to enlist in the Army in September 1942.

Detrex Plant Engineer

A. O. Thalacker, vice president and general manager of the Detrex Corporation, Detroit 32, has announced the appointment of J. D. Hamacher as plant engineer. Mr. Hamacher is a graduate of the University of Detroit and since joining Detrex, early in 1944, has been employed as design engineer in the oil-extraction division. His new duties include plant layout and supervision of maintenance of all Detrex properties and buildings.

Manufacturer of equipment and chemicals used in the metal-cleaning and dry-cleaning industries, Detrex has recently occupied its new administrative and plant headquarters at 14331 Woodrow Wilson, Detroit, Michigan.

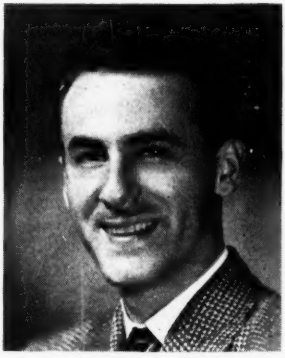
Pennsalt Names Lea Advertising Manager

Sydney L. W. Lea, recently released from active duty as an Army captain, has been named manager of advertising of the Pennsylvania Salt Manufacturing Company. At the same time Anne Hurlbrink was named assistant advertising manager.

Mr. Lea succeeds Mrs. Ethel Serfas Klingman, who is retiring from business. Before entering the service, Mr. Lea was assistant to George B. Beitzel, now vice president in charge of sales.

Added to Technical Serivce Division Staff

The appointment of Thomas G. Franzreb to the Technical Service Division staff of Turco Products, Inc., is announced by Ray Sanders, vice president and general manager of the company. Located at the company's Los Angeles office, 6135 S. Central Ave., where he will be available to assist in solving maintenance problems, Mr. Franzreb is a grad-



Thomas G. Franzreb

uate of Wagner College, New York City, and has done considerable post-graduate work in the field of chemistry at Columbia University.

Entering the Navy in 1944, Mr. Franzreb spent two years as materials laboratory officer in the Engineering Division at Jacksonville, Florida. He was released from active duty in April of 1946 with the rank of Lieutenant in the Naval Reserve.

Job Platers' Meeting

One of the outstanding events of the convention of the American Electroplaters' Society was a meeting of job platers held on Tuesday evening, June 18th, at the Hotel William Penn. This dinner meeting was attended by 88 platers from all parts of the United States. The chairman was Edward J. Musick, of Musick Plating, Inc., St. Louis.

The official business was divided into two sections: first a report by Adolph Bregman, of New York, reviewing the progress of the job plating industry during the past year, and second, a report by Raymond M. Shock, of Detroit, on a plan for a proposed national association.

Mr. Bregman stated that during the past year, the industry as a whole had prospered, but was faced with a number of postwar problems such as a shortage of skilled polishers and miscellaneous plating materials, especially buffs and silver. He also mentioned cadmium and chromium chemicals as other materials that are difficult to obtain.

Mr. Shock outlined the formation of a National Association of Metal Finishers to include platers, enamelers, and rustproofers. After extended discussion, it was voted to proceed with such an organization and to set dues on a graduated scale based upon the capacity of the member firms. The National Association will be composed solely of local groups in various parts of the country and individual firms will join their nearest local association.

During the next morning, another meeting was held by the Steering Committee at which ways and means were laid out for the organization. At the present time local associations are functioning in New York, Detroit, Boston, Chicago, Los Angeles, and San Francisco, but the National Association will aid in the formation of new local groups as fast as possible.

One of the local groups to be formed will cover the Mississippi Valley, including in its territory Missouri, Kansas, Oklahoma, Texas, Louisiana, Arkansas, Western Kentucky, Tennessee and Southern Illinois. The prime mover in this organization will be Edward Musick of St. Louis.

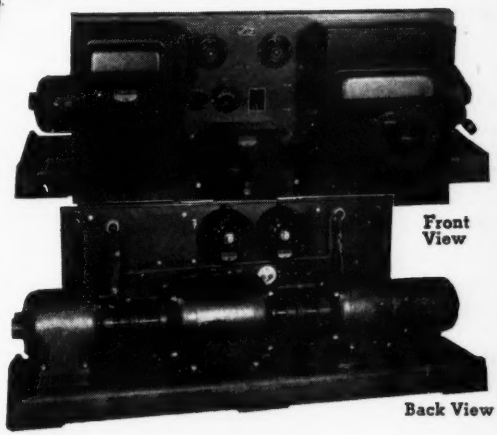
All platers in the territory described above are asked to communicate with Mr. Edward J. Musick, Musick Plating, Inc., 206 S. 9th St., St. Louis, Mo. The objects of the National Association are to promote the general welfare of its members, especially as it may pertain to matters affecting management, labor relations, legislation, taxes, and so on.

LOW VOLTAGE MOTOR GENERATORS
AT REDUCED PRICES!

Government surplus stock of brand new low voltage DC motor generator units are now available to you at a fraction of their original cost! Compact, single unit construction assures long life and minimum maintenance. Motor, generators and control panel mounted on heavy cast iron base. Continuous duty 2 HP Master Electric Motor (115-230 V. 60 Cycle, Single Phase) drives 2 DC generators, each of which delivers 41.7 amperes at 12 volts, 500 watts. No. 1 generator has exciter unit to energize both main generator fields. Generators can be operated singly or in parallel to produce maximum of 83.2 amperes at 24 volts, 1000 Watts. Complete with Cutler-Hammer motor controls, voltmeter, ammeter, switches, etc. Quantity 80. Price $165.00 F.O.B. Chicago.

Also available—3 Bardco Motor Generators 15 H.P. Master Electric 220-440 V. 3 PH.—60 Cycles motor is direct connected to Kurz & Root Generator with DC output of 313 amperes at 26-32 volts at 1750 RPM—10 K. W. Units are mounted in welded structural steel base.

tural steel base. Each, $750.00 F.O.B. Chicago.

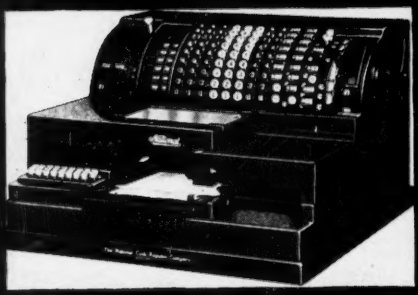


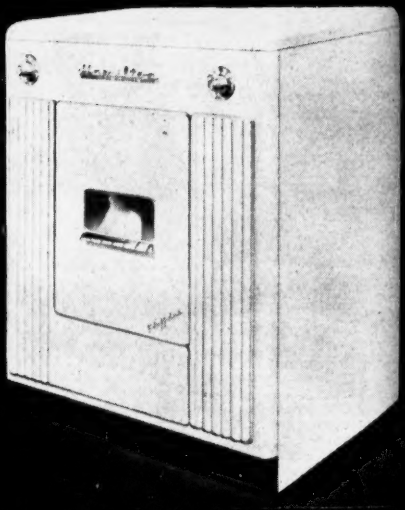
Front View

Back View

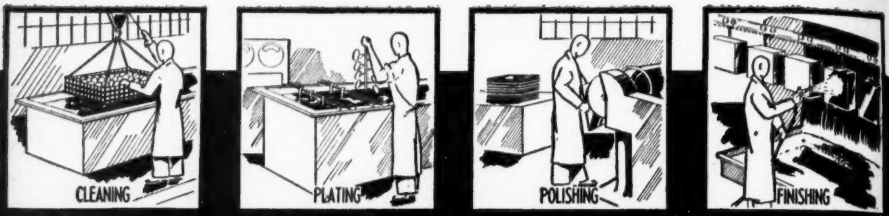
ACME EQUIPMENT COMPANY, INC.

128 S. Clinton Street **Chicago 6, Illinois**





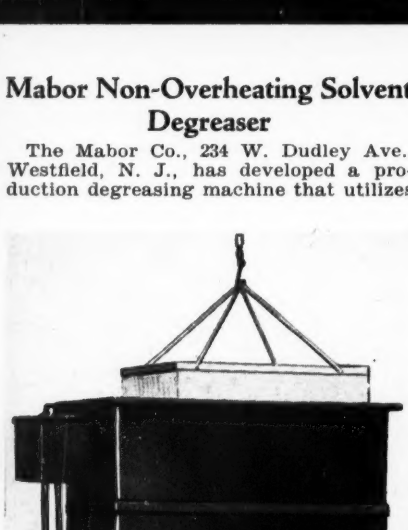
SERVEL



New Equipment and Materials

Mabor Non-Overheating Solvent Degreaser

The Mabor Co., 234 W. Dudley Ave., Westfield, N. J., has developed a production degreasing machine that utilizes a liquid jacket heating system which operates at atmospheric pressure. In this manner, gentle, uniform heat is provided, thereby avoiding the danger of the solvent overheating and reducing the necessary amount of fluid in the equipment, the manufacturer states.



Mabor Non-Overheating Solvent Degreaser

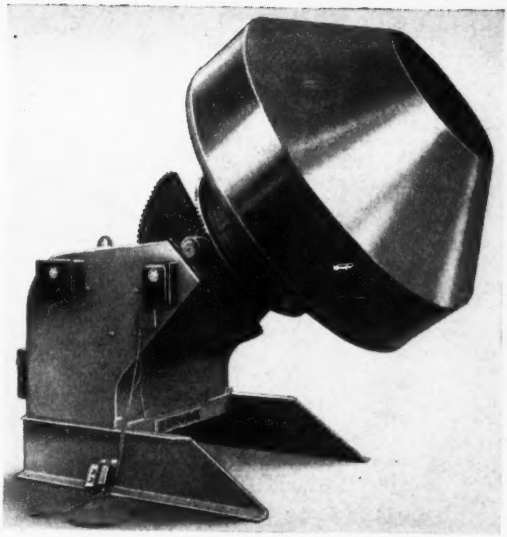
The Mabor Non-Overheating Solvent Degreaser can be heated with high pressure steam without the use of a pressure-reducing valve, or with gas or electricity without any possibility of overheating the solvent, it is claimed. The degreaser is also equipped with an automatic control system that preheats the circulating water above the dew point. An automatic oil and grease skimming device included as standard equipment is so designed as to require no attention. According to the manufacturer, distillation is handled in the equipment completely without danger even when the last drops of solvent are being distilled.

The Mabor Degreaser can be readily installed by simply connecting the heat and water lines. The unit is equipped with safety controls and is built in many standard sizes, with custom-built units being available for vapor, vapor spray, and liquid vapor. In addition, conveyorized machines in any size can be built for any kind of cleaning requirement.

Ransome Rotating Pan-Type Mixer

A rotating pan-type mixer for a wide variety of uses in industries requiring

Ransome Rotating Pan-Type Mixer



mixing, blending, tumbling, polishing, finishing, and similar operations has been developed by the Ransome Machinery Co., 1447 S. Second St., Dunellen, N. J. The rotating pan is motor tilted and motor rotated at constant speed. A variable speed drive can be furnished where materials handled require the rotating speed to vary.

The pan is of all-metal construction with joints welded and ground smooth. For mixing or blending two or more ingredients, mixing blades are added as necessary to assure thoroughly mixed, uniform batches. With a 135-degree tilting range, materials are said to be completely and cleanly discharged from the rotating pan. Safety limit switches are installed at the two extreme ends of the tilting range, and the unit is operated by remote push-button control.

The Ransome Rotating Pan-Type Mixer is available in sizes up to 2,500 lb. (50 cubic foot) batch capacity.

Oakite Pickle Control No. 3

A material which is designed primarily for inhibiting hot sulphuric-acid pickling solutions, to be known as Oakite Pickle Control No. 3, is announced by Oakite Products, Inc., 24H Thames St., New York 6, N. Y. A yellowish-brown free-flowing powder with a density half that of water, the material may be used in mixed sulphuric-hydrochloric baths in which sulphuric acid predominates.

Applications for Oakite Pickle Control No. 3 include the pickling of many types of ferrous alloys and castings, hot and cold rolled steel, and in operations where pickling is done prior to plating or phosphate coating or where zinc coatings are stripped. Savings in metal and acid and reduction in fuming, hydrogen embrittlement, pitting, and discoloration of work are advantages claimed for the material. By retarding the build-up of iron sulphate in solution, the material is said to minimize the frequency and cost of spent liquor disposal.

Rayon "Cellophane Spangles"

The Rayon Processing Co. of R. I., Inc., 65 Tremont St., Central Falls, R. I., is now in production on "Cellophane Spangles," a surface coating consisting of very finely cut particles of cellophane. Produced at present only in white ("clear"), the spangles when applied to a surface are said to give it a distinctive sparkle due to the reflection of light by the million of tiny facets.

Rayon Cellophane Spangles may be applied to plastic, metal, rubber, and other products having either plane or irregular surfaces. When used as a decorative coating, clear spangles can be given a colored effect by the use of colored adhesives. The lively sparkling finish produced by the spangles is not only said to be distinctively novel but also tough and durable.

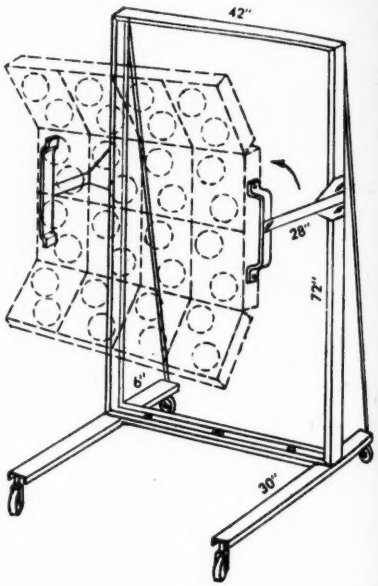
Miskella Portable Non-Tip Infra-Red Frame

A portable non-tip frame for any combination of Superheat units utilizing any size clear or reflector infra-red lamps at any tilt is now being manufactured by The Miskella Infra-Red Co., E. 73rd and Grand Aves., Cleveland 4, Ohio. The design includes a welded floor assembly,

welded vertical frame with reinforcing rods, and powerful side arms which are free to slide 66 inches and have provision for locking so as to enable any setting within the 360-degree movement of the Superheat units to be readily obtained and maintained.

The long floor legs which support the overhead load are equipped with four 3-inch ball bearing swivel casters and are constructed in such a manner as to permit them to be positioned under roller conveyors, automobiles, benches, and so on. The end wings of the infra-red unit are universally adjustable and, for complete flexibility, the control switch and power connection are mounted on the back of the middle section of the Superheat unit.

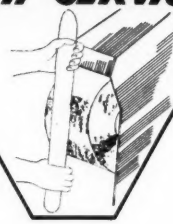
Miskella Portable Non-Tip Infra-Red



Miskella Portable Non-Tip Infra-Red Frame

Frames may be used face to face as over a belt or roller conveyor—even with one above and the other below. Either a single frame or pair of frames equipped with any Superheat unit combination may serve as an oven or a tunnel when the frames are used side by side.

GRAINLOCK CEMENT WITH SERVICE!



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Lea Manufacturing Co. - - - - - Waterbury, Connecticut
Mill Supply & Machinery Co. - - - - St. Louis, Missouri
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INDUSTRIAL LUBRICANTS CO., INC.
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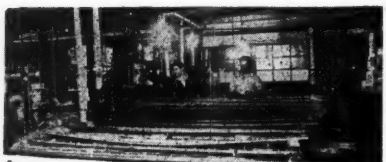

PERMAG ***for quick, efficient Cleaning of Metal Surfaces before Plating . . .***

PERMAG Compounds can be used in still tank, also with direct or reverse current. PERMAG Compounds produce a chemically clean surface quickly and economically, insuring a perfect finish.

Our Technical Service will be glad to cooperate in solving difficult metal cleaning problems. Write or 'phone.

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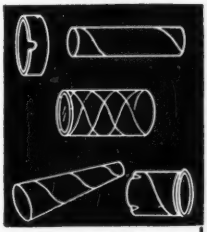
Every Fine Little Unit DESERVES this PROTECTION!

PRECISION Dust Caps and Thread Protectors



In storage or transit. Save hunting for makeshifts. Protection inside and out, from rust, dust, grit, moisture and rough handling. For all shapes. Economically priced. Send for samples.

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Hammond of KALAMAZOO

BACKSTANDS

CONVERT

GRINDERS-POLISHERS

into high production

ABRASIVE BELT UNITS

Hammond Variable Speed Polishing Lathe and No. 3 Backstand installation.

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Corrosion doesn't stop

No one is more aware of this fact than the corrosion engineer, whose time is devoted to fighting the ravages of contamination and corrosion in all industry. The Amercoat laboratories have conducted a continuing research program on the broad field of expanding the usefulness of their plastic coatings. The wide range of Amercoat coatings today represents years of laboratory work and field tests. Amercoat is a positive barrier to the corrosive action of salt water, hydrogen sulphide, caustic soda, sulphuric acid, lactic acid, and many other corrosive salts, alkalies and acids. Amercoat Plastic Coatings are cold-applied by brush or spray to metal, concrete or wood. They dry quickly by evaporation of the solvents. Write for details and names of users.

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P.O. Box 3428, Terminal Annex, Los Angeles 54, California

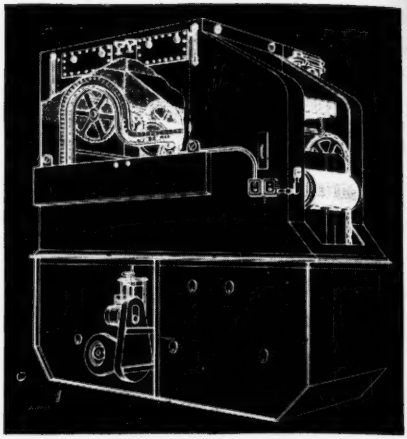
M & W Coprene Enamels

Coprene Enamels, formulated with a modified synthetic rubber base, are now being manufactured by the Maas & Waldstein Co., 438 Riverside Ave., Newark 4, N. J. Described as chemically-resistant air-drying high-gloss finishes, the enamels are available in most colors and are recommended for use on steel and most other metal products, including cabinets, furniture, air conditioning equipment, and similar items requiring a chemically-resistant air-drying or baking finish. They are said to be tough, flexible, and resistant to outdoor exposure.

M & W Coprene Enamels are also made with metallic powders to produce metal-like coatings (Coprene Metalustre Enamels) and finishes resembling beaten metal.

Detrex "1 DC-750" Vapor Degreaser

As an addition to its present line of metal degreasing equipment, the Detrex Corp., 14331 Woodrow Wilson, Detroit 32, Mich., has introduced a standard conveyorized one-dip concentrator to be known as the "1 DC-750". Small and compact, the unit is designed to degrease small miscellaneous screw machine parts and is said to be ideally suited to small shops where floor space is at a premium. The machine occupies less than 75 square feet of floor space and measures but 9 feet 9 inches in height.



Detrex "1 DC-750" Vapor Degreaser

The Detrex 1 DC-750 Vapor Degreaser may be supplied with rotary or a combination of rotary and flat baskets. Rotary baskets are 10 inches in diameter x 20 inches long. Work to be cleaned is loaded at one end of the degreaser, carried through the cleaning cycle, and is returned through the upper hood to the same end of the machine for unloading. The conveyor system is complete with sprockets, shafts, take-up device, speed reducer, and variable speed drive. All of the sprockets below the vapor line are zinc plated, as are all crossrods and conveyor chains.

Clean Spray Booths

Spray BOOTHCOTE on clean booth.
Paint peels off in sheets.
NO SCRAPING—SAVE TIME and LABOR
Trial offer 5 gal. $5.50 F.O.B. Buffalo
Used by 2000 leading manufacturers.
MONEY BACK IF NOT PLEASED.
Write for Circular.
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ALLWOOD
"Vienna Brand" Lime
Made from Limestone that is identical in chemical analysis and geological structure with European Imported Lime. Tests show a "lime cake" made from Allwood "Vienna Brand" Lime equals the finish made from imported lime.
WRITE FOR FULL PARTICULARS
ALLWOOD LIME COMPANY
Manitowoc • Wisconsin

To help increase "Take-Home Savings"

The Treasury Department has published two new booklets to help you and your employees realize the utmost benefit from your Payroll Savings Plan.

"Peacetime Payroll Savings Plan" for key executives offers helpful suggestions on the conduct of the Payroll Savings Plan.

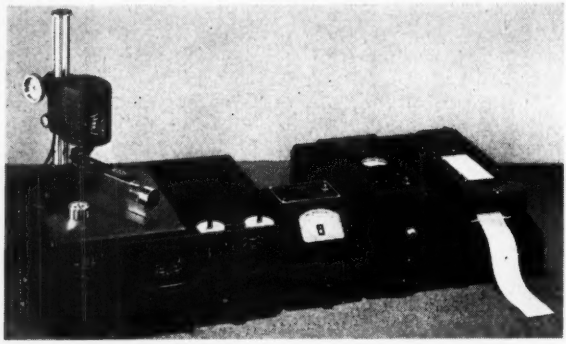
"This Time It's For You" is for distribution to employees. It explains graphically how this convenient, easy thrift habit works. It suggests goals to save for and how much to set aside regularly in order to attain their objectives.

If you have not received these two booklets, or desire additional quantities, communicate with your State Director of the Treasury Department's Savings Bond Division.

The Treasury Department acknowledges with appreciation the publication of this message by

PRODUCTS FINISHING

This is an official U. S. Treasury advertisement prepared under the auspices of the Treasury Department and Advertising Council



Brush Model BL-103 Surface Analyzer

Brush Model BL-103 Surface Analyzer

The Brush Model BL-103 Surface Analyzer illustrated herewith, product of The Brush Development Co., 3405 Penkins Ave., Cleveland 14, Ohio, is designed to check surface finishes from less than 1 to 5,000 microinches. Exploration is achieved with a fine diamond point. An instantaneous chart record on the Brush magnetic direct-inking oscillograph provides an accurate "peak and valley" profile of surface finish. Rapid warm-up time (2 minutes) makes possible instant use in cases where time delay would affect inspection. Accessory equipment for the unit includes a Brush "RMS" meter which provides a constant visual check of "RMS" surface roughness where "peak and valley" profiles are not needed.

Measuring surface finishes of metals, glass, plastics, plated and painted surfaces are some of the uses for the Brush Model BL-103. Human error is said to be eliminated by a power-driven pickup and accurate chart record.

The Brush Model BL-103 Surface Analyzer consists of a pickup arm, drive head, amplifier, magnetic direct-inking oscillograph, surface plate, carrying

FORM-A-ROC - W

A Perfected White Alkyd-amine Baking Enamel

Complete hiding power, great adhesion, remarkable flexibility coupled with high surface hardness.

Baking schedules from one minute at 425 degrees F. to one hour at 150 degrees F. available.

Form-A-Roc formulation are also available in a wide range of colors and in a clear, tough, resistant topcoat.

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The Varnish Products Co.

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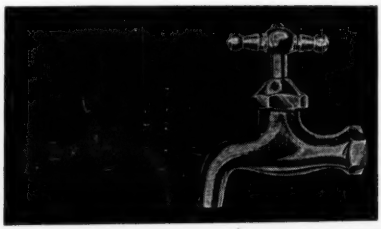
Cleveland, Ohio



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Bright Nickel Process

Produces Brilliant Adherent Nickel Deposits. Ideal Base for Chromium.

No color buffing • No re-cleaning • No re-racking • No special solutions. Merely add to cold nickel solution, still or mechanical • No extra equipment.

Guaranteed not to harm Nickel Solutions

Illustration shows unbuffed deposits before and after Lustrebright.

Write for complete information.

W. C. BRATE COMPANY

Established 1860

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TYPE YBA
TWO-POSITION VALVE

MOTOR-OPERATED VALVES FOR FINISHING CONTROL

Barber-Colman *electric* Motor-Operated Valves offer a number of advantages for the control of plating tanks, anodizing baths, and many other finishing operations where uniform temperature must be maintained for best results. Reliable shut-off is provided by positive power-driven seating. Current is consumed only when the valve is changing position. Motors are available for either high-voltage or low-voltage lines. Control can be by thermostat, by standard contact-making recorder-controller, or by remote manual switches.

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THE PERFECT COMBINATION
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- Infra Red Ovens
- Conveyors
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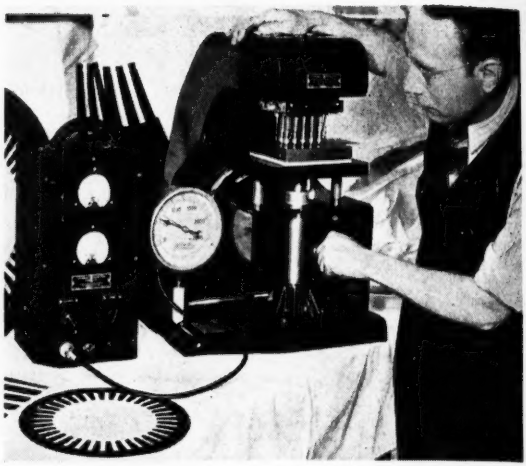

G-E Core-Plate Enamel Tester being used to measure the insulating value of enamel coating on sheet steel

cases, glass calibration standard, two V-blocks, and necessary chart paper, ink, and so on. The company has also developed accessory pickups for "hard-to-get-at" surfaces such as flanks, threads, thread gages, tool edges and wire surfaces as well as walls of bores and rough finishes.

G-E Core-Plate Enamel Tester

A core-plate enamel tester designed for measuring the insulating value of enamel coating on sheet steel or steel punchings has been announced by the General Electric Co., Schenectady, N. Y. Consisting of a test head, a hydraulic press, and a control unit, the tester provides a standard for measuring the insulating quality of enamels, and thus facilitates selection of the best enamel for any insulating application. The instrument is said to be especially useful for testing rotor cores as it simulates the conditions of heating and pressure which may exist in a core.

The core-plate enamel test head has 10 insulated brass contact buttons backed by spiral springs which provide independent pressures of from 500 to 750 p.s.i. These are mounted beneath a steel base upon which two ⅛-inch twist drills are located. The test head itself is mounted on the upper plate of a C-shaped hydraulic press, and a heater is mounted on the lower plate of the press. The control unit is the source of power, and contains the indicator for the enamel

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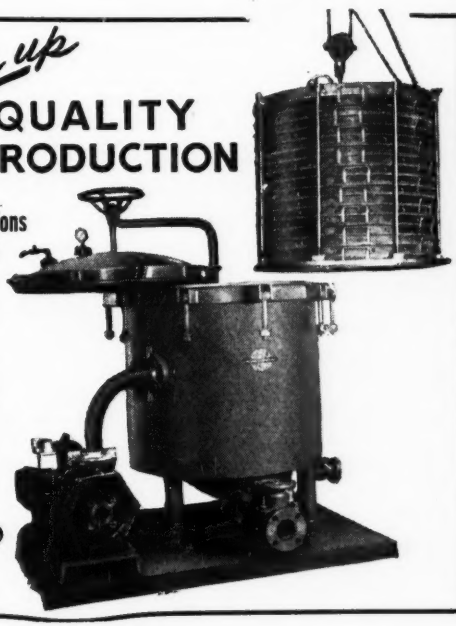

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SPARKLER HORIZONTAL PLATE FILTERS

resistance measurement. The jack has a capacity of 20,000 lb., and the heater has a maximum temperature rating of 300 deg. C.

To operate, the heater is first brought up to the desired temperature and the test specimen is placed upon it and allowed to stand for about a half minute. The hydraulic press is then pumped until the required pressure value is obtained. The press forces the enameled specimen against the 10 contact buttons of the test head, compressing the springs and forcing the two drills into the specimen. Thus, a closed circuit is formed with the current passing through the contacts and enamel to the core metal and back through the drills to the power supply. The control unit is then switched on and adjusted to ½ volt across the enamel coating. Good insulating properties are indicated by a low current reading on the ammeter. A direct short circuit or no insulation would give a reading of one ampere.

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COLOR COAT
A BEAUTIFUL PROTECTIVE FINISH
For ALUMINUM, MAGNESIUM
ZINC, BRASS, STEEL

- Adheres To Any Surface
- TOUGH and FLEXIBLE
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- Resists Most ACID, ALKALI or BRINE SOLUTIONS or VAPORS
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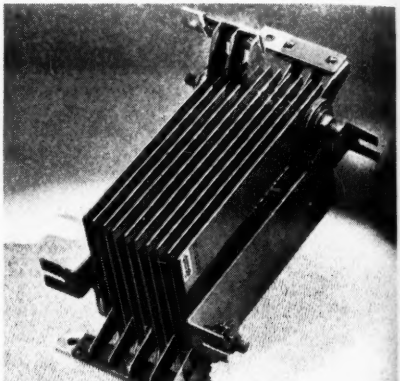
STEEL PROTECTION & CHEMICAL CO., INC.
Mooresville 3, Indiana

Federal Heavy Duty Selenium Rectifier Stack

A heavy duty selenium rectifier stack featuring double studs, center contact



Federal Heavy Duty Selenium Rectifier Stack

construction, and 26-volt plates is now being manufactured by the Federal Telephone and Radio Corp., Newark, N. J. Employing rectangular, square-cornered plates, the stack is designed for mounting either in a vertical position or a horizontal position, thereby affording improved and unobstructed circulation of air for plate cooling.

The Federal Heavy Duty Selenium Rectifier Stack is claimed to be particularly useful in cathodic protection, electroplating, anodizing, large battery chargers, and other applications where power requirements are heavy. As the result of the double mounts, vibration in rectifiers is claimed to be eliminated. Moreover, the mounting of a. c. and d. c.

For a real good polishing job use
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KEYSTONE EMERY MILLS Write for Sample 4316 Paul St., Phila., Pa.

bus connections has been simplified. At the same time, maximum space utilization for heavy duty current applications has been achieved.

The Federal Heavy Duty Selenium Rectifier Stack consists of plates possessing unusually high reverse voltage. The plates are designed to withstand an RMS voltage of 26 volts per plate.

"Vyncote" Vinyl Plastic Coatings

Known as the "Vyncote," a series of vinyl plastic coatings for application in the metal products industry is now being marketed by the Vyncote Division, Watson-Standard Co., 225 Galveston St., Pittsburgh, Pa. According to the manufacturer, the Vyncote plastics form a flexible surface film that retains all the properties of solid plastics. The coatings are said to resist water, grease, oil, chemicals, heat, and so on, and are adaptable to any baking cycle.

Suggested uses for Vyncote coatings compounded to individual requirements include coatings for beer and food cans, oilcans, drums, and pails; interior and exterior linings for collapsible tubes; linings for refrigerators and stoves as well as exterior finishes for both; chemical-resistant linings for chemical containers of all types; and coatings for coil-water heater jackets subjected to heat as high as 500 deg. F. The Vyncote prescription vinyl plastic coatings are described as completely inert, non-toxic, tasteless, and non-inflammable and are available in colors or water-clear to suit individual requirements as to use and method of application.

Nickel Strip

A formula which makes use of "Troxide" to strip nickel from brass parts is announced by the Waverly Petroleum Products Co., Drexel Bldg., Philadelphia 6, Pa. The formula consists of 30 lb. of Troxide, 7 gallons of nitric acid (36° Bé.), and 3 gallons of water.

The parts to be stripped are dipped in the solution for approximately three minutes, the solution being employed at a temperature of 100 deg. F. The parts are then washed in an alkaline cleaner, which leaves the brass bright and shiny and free from all nickel.

BULK PARTS CLEANED FASTER WITH HOWARD MACHINE

Up to 20 cubic feet of bulk parts per hour are thoroughly cleaned and dried in this latest HOWARD Drum Type Washing Machine. There are many new advantages—an extra-large loading hopper, automatic load leveling . . . new, easier maintenance features provide economy of operation and maximum production. Howard Engineers will be glad to survey your metal cleaning or finishing without obligation.

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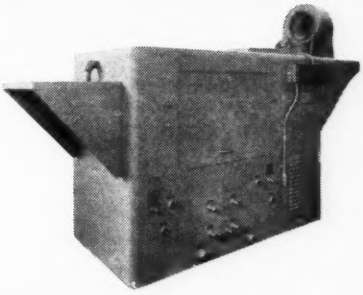

No. 352 New Howard Drum Type Machine Washes, Rinses and Dries quantities of bulk parts with speed and economy.

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HOWARD ENGINEERING & MANUFACTURING CO.

2237 BUCK STREET

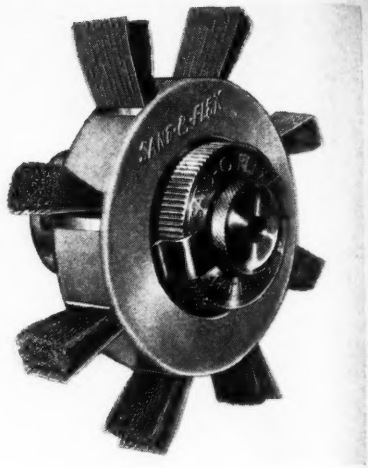
CINCINNATI 14, OHIO

Sand-O-Flex Model 350-B Sanding Wheel

The Sand-O-Flex Corp., Dept. 461, 4373 Melrose Ave., Los Angeles 27, Calif., announces a brush backed sanding wheel to be known as the Sand-O-Flex Model 350-B. Similar to its predecessor, Model 550-A, but smaller in diameter and lighter in weight, the Model 350-B measures 3⅝ inches in diameter (5½ inches overall including brushes) and weighs 1⅞ pounds.

The design includes eight replaceable brushes which "cushion" an abrasive strip, thus providing the flexibility necessary for finishing irregular surfaces. According to the manufacturer, the wheel can be effectively used on any electric motor shaft; a 1/6 h.p. motor or a ¼-inch capacity electric hand drill is adequate. The unit is recommended for operation at speeds from 400 to 1,750 r.p.m. and is designed to fit ½ and ⅝-inch shafts. Adapters to allow for the use of the wheel on threaded spindles can be supplied.

Easily manipulated on portable tools or flexible shafts in finishing recesses or contoured surfaces, the Sand-O-Flex Model 350-B Sanding Wheel can be loaded with a wide variety of grits, especially prepared for use in the unit. The wheel is claimed to be ideal for use in performing hand scraping, sanding, deburring, and sanding operations on small work.



Sand-O-Flex Model 350-B Sanding Wheel

CUT DRYING AND BAKING TIME...INCREASE PRODUCTION

with
NALCO INFRA-RED LAMPS

Instantly responsive, highly efficient radiant heating that reduces drying and baking time from hours to minutes.

Send for bulletin "Drying Problems Made Easy."

North American Electric Lamp Co.
1020 Tyler St. St. Louis 6, Mo.

"Stripode"

For nickel stripping processes, The Chemical Corp., 54 Waltham Ave., Springfield 9, Mass., now has available "Stripode," an agent which, when added to a sulfuric acid strip, is said to speed up the removal of nickel plate and protect the base metal from pitting, roughening, and etching. The material is added to the sulfuric strip at a concentration of ¼ to ½ oz. per gallon. An acid strength of 50 to 55 degrees Bé. is said to be most satisfactory.

STRIP Copper . . . evenly . . . no hydrogen embrittlement.

McKeon's "Liquid Sulphur"

Service Free

SULPHUR PRODUCTS CO. • Greensburg 7, Pa.

G-BEX D Ready-to-Use Emulsifying Degreaser

A ready-to-use emulsifying degreaser designated as G-BEX D is now being marketed by the Gaybex Corp., P. O. Box 3-D, Nutley 10, N. J. The material is described as a neutral emulsifying solvent having a minimum flash point of 165 deg. F. (A.S.T.M. C.O.C.). It is said to be non-irritating to the skin and is considered non-corrosive to all standard construction metals.

According to the manufacturer, G-BEX D will not strip paint or lacquer and may be used for light or heavy duty degreasing by spray, brush, or soak application followed by water rinse. The material is supplied in 5 and 54-gallon drums.

Britehoning Process

Britehoning, a mechanical finishing process for small parts, is announced by The Sturgis Products Co., Sturgis, Mich. It is offered to the finishing industry as an efficient means of processing small stampings, forgings, machined parts, extrusions, die castings, and sand castings.

The process is basically a tumbling method involving the use of mineral chips and suitable compounds for developing a fine semi-lustrous finish on practically all types of metal parts. It is said to be ideally suited as a preplating operation for finishing small zinc base die castings or brass stampings prior to bright nickel and chrome plating. Steel and aluminum parts can be finished by the same procedure with equally satisfactory results.

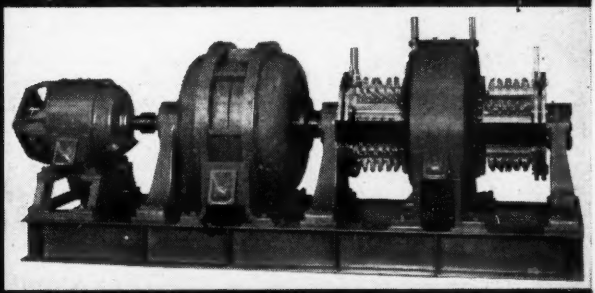
Parts to be finished can be processed directly after the forming or trimming operation, providing the die marks or stretcher marks do not penetrate too deeply into the surface of the part. Die castings, if closely trimmed, may be processed as received from the trim die, however, if the trimming is not close, a polishing wheel or abrasive belt operation may be necessary to remove same prior to Britehoning.

Miskella Infra Test-Kit

Compact, portable, and universally adjustable for tests and demonstrations in

COLUMBIA MOTOR GENERATORS

for Electroplating and other Electrolytic Processes



Columbia Generators embody every feature essential for dependable, 24-hour operation. They are built for electroplating service in sizes of 6 to 20 volts, 500 to 20,000 amperes, for anodic treatment of aluminum in sizes of 40, 50, and 60 volts, 500 to 3,000 amperes. Columbia Generators for other electrolytic processes range from ½ to 250 KW, 100 to 40,000 amperes, 6 to 60 volts. Write for full information.

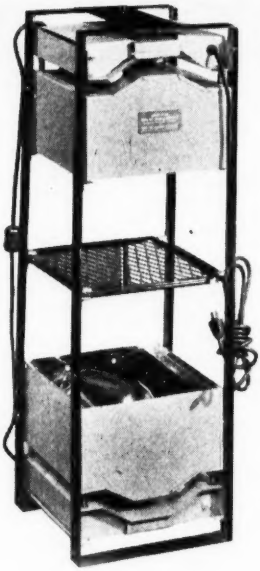
COLUMBIA ELECTRIC MFG. CO.

4519 HAMILTON AVE., N.E. CLEVELAND 14, OHIO

Chicago Office — 1525 E. 53rd St.

all types of laboratories, the Miskella Infra Test-Kit illustrated herewith has been brought out by The Miskella Infra-Red Co., East 73rd and Grand Aves., Cleveland 4, Ohio. The unit, which weighs 40 lb. complete, measures 36 inches x 12 inches wide x 12 inches deep. Wired for 115 volts unless otherwise specified, the unit can be operated either on a.c. or d.c., supplying temperatures from 70 to 400 deg. F. Heating units are insulated and either clear or reflector lamps may be used.

Standard equipment of the Miskella Infra Test-Kit includes two Miskella Super-Heat insulated heating units, 8¼ x 10¼ x 8 inches deep; four Mazda infra-red reflector lamps sealed in vacuum, each 250 watts; metal-edged expanded metal easy-sliding shelf, 11 x 12 inches; two control switches—one for each heating unit; sturdy supporting framework to support units either vertically or horizontally; flexible cord 10 feet long with attachment plug; and flexible cord with break-apart connector between the two heating units. The heating units are widely adjustable away from the work placed on slide tray. Work may also be hung from the side when the Test-Kit is laid down. Individual toggle switches provide for finger-touch control of the unit, which is designed to instantly deliver a maximum of 3,000 B.T.U. of infra-red heat.



Miskella Infra-Test Kit

"Rip-pl Finishes," which provide in one-coat application distinctive wave-line effects on rough, non-porous surfaces, are the subject of a bulletin prepared by the Hilo Varnish Corp., 60 Stewart Ave., Brooklyn 6, N. Y. Copy of Bulletin No. 15 free upon request.

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ACCURATE TO MICROMETER DIMENSIONS

For efficiency in finishing metal parts, install a DEBURRMASTER.

Save time, money and produce assured results.

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Any plating solution analyzed for 50¢. We also sell all reagent solutions for analyzing.

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ELIZABETH, NEW JERSEY

Jelliff Rubber Covered Steel Baskets are the subject of a four-page illustrated folder now available free from The C. O. Jelliff Manufacturing Corp., Southport, Connecticut.

Full Automatic Conveyors. A 28-page bulletin has been issued by the Hanson-Van Winkle-Munning Co., Matawan, N. J., on full automatic electroplating conveyors. The bulletin describes the complete line of conveyors made by the company, including the Elevator type, the Munning type, the Straight-Line type, and a variety of special plating machinery such as caustic cleaning lines, tin plating lines, machines for plating wire, cable, zippers, and so on.

The bulletin is profusely illustrated with photographs and with phantom assembly drawings of the Elevator type and the Munning type conveyors. Copy is available free by requesting Bulletin No. FA-102.

Presto Polishing Room Accessories. An unusually complete catalog of polishing room accessories is announced by The Manderscheid Co., 810 Fulton St., Chicago 7, Ill. Treated are semi-automatic tube polishing machines, work-holding

Presto
POLISHING ROOM
Accessories
BULLETIN 103
Work Holding Spinners Page 2
Spinner Ceiling Support Page 2
Polishing Wheel Balance Ways Page 3
Tube Polishing Machines Page 4
Tube Support Stand Page 4
Work Supporting Roller Page 5
Scratch Brush Lathe Page 5
Polishing Wheel Bushings Page 6
Nuts and Flanges Page 6
Balance Weights Page 6
Screw Points and End Chucks Page 7
Buff Chucks and End Plate Chucks Page 7
Lathe Collars and Wrenches Page 7
Modern Wheel Rakes Page 8
Cast Iron Emery Troughs Page 8
The MANDERSCHEID Co.
810 Fulton Street Chicago 7, Illinois
Serving the Metal Finishing Trade over 35 Years

spinners, balance ways, wheel rakes, and many other items which are designed to save time and increase efficiency. Copy of Bulletin 103 free upon request.

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Opportunity Section

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1 Ronci Speed-Dip Machine
Style R200, 220 volt, 3 ph, 60 cyc.
2 dip tanks, 1 basket, slightly used.

The Penn Rivet & Machine Co.
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SALESMAN, established chemical manufacturer, undertaking progressive, expanding program, seeks experienced representatives to sell low cost chemical products in bulk as soaps, degreasers for metal processing, automotive, machine, aircraft fields. Commission, drawing exclusive territories. Write Box 80, Products Finishing, 431 Main St., Cincinnati 2, Ohio.

WANTED — Sales Engineer, 35-45, by nationally known manufacturer of Automatic polishing and buffing equipment, to travel mid-west territory. Require man having mechanical ability and wide experience with all types of polishing and buffing wheels, compositions for metal and plastic desirable, but not required. Permanent position with excellent opportunity for qualified man. Please state age and experience in first letter. Write Box 81, care of Products Finishing, 431 Main Street, Cincinnati 2, Ohio.

WANTED: Color matcher. Must be experienced on Industrial Finishes. Good pay. Good working conditions. Permanent. Northeast location. Write giving full particulars, age, experience and salary expected. Write Box 89, Products Finishing, 431 Main Street, Cincinnati 2, Ohio.

Manufacturers Representative for the following products wanted in Indiana, Illinois, New York:

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Klem "Sol Flux"
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Klem Cleaners

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THIS Opportunity Section is available for classified advertisements featuring equipment, employment, business opportunities, etc., in the industries devoted to the cleaning, plating, polishing and finishing of metals. For advertising rates and other information address:

PRODUCTS FINISHING
431 Main Street • Cincinnati 2, Ohio

"Spraying Compositions to Buffs." The J. F. Siefen Co., 5659 Lauderdale Ave., Detroit, Mich., has prepared a four-page folder which provides information on the development of a spray method of applying compositions to buffs for satin and mirror finish. Written by John F. Siefen, vice president of the company, the folder is being offered free upon request.

Baker & Adamson Laboratory Reagents. Baker & Adamson, Division of General Chemical Co., 3909 Capitol Ave., Houston, Texas, now has available a 188-page plastic-bound catalog listing laboratory reagents and chemicals, including "Reagent," "C. P.," "U. S. P.," "N. F.," "Purified," and "Technical" grades. Helpful tables on international atomic weights, Centigrade and Fahrenheit conversion factors, and so on, are included at the rear of the catalog, copy of which is available free to mechanical executives addressing requests on their company letterheads.

Granium Products. Granium Products, 2616 Downey Rd., Los Angeles 23, Calif., has prepared an eight-page folder which provides descriptive and price information on its precious metal alloys; anodes and cyanides for electroplaters; Granium silver cyanide; Granium silver anodes; Goldtone anodes; magnesium and aluminum alloys; amalgams for copper alloy and Granium Prussian Blue for paint and dye industries. Copy free upon request.

"Physical Properties of Synthetic Organic Chemicals," a 12-page booklet, has been issued by Carbide and Carbon Chemicals Corp., 30 E. 42nd St., New York 17, N. Y. Data on the physical properties and applications for more than 175 synthetic organic chemicals are presented in tabular form for ready and easy reference. The booklet has been designed as a condensed guide for research chemists, laboratory technicians, and purchasing agents. Copies can be obtained without charge by writing to the company, requesting Form 6136.

Please mention PRODUCTS FINISHING when writing to advertisers.

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TOWARD THE
RIGHT *FINISH*

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All Tex-Drive Buffing and Polishing Machines are skillfully designed to give you maximum freedom of operation for the handling of large or awkward sized work. Tex-Drive Buffers and Polishers require minimum floor space.

Whatever your metal finishing requirements are, there is a Hisey Buffing and Polishing machine to fit it.
Sizes available 1 to 25 h.p.

Write for Descriptive Catalog 70-Z

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The Finishing Touch

By J. A. Patterson

"Yardley, did you ever consider using an underarm deodorant?"